INSTALLATION MANUAL
WOOD CHIP BOILER ECO-HK 20-60

HARGASSNER
HEIZTECHNIK MIT ZUKUNFT

Exactly read, follow and save these instructions

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Chapter III: Installation

1 General

This installation manual is part of the *Operation manual* for this boiler series.

D A N G E R

Observe safety and operational instructions!

Death, injury, damage due to "ignoring" of safety instructions

- Strictly read and follow the safety instructions in this manual
- Exactly read and follow the operation manual
- The accomplishment of the activities, described in this manual are only allowed to be carried out by Hargassner - trained installation personnel.

D A N G E R

Observe execution of the boiler- and the fuel storage room!

Death, injury, damage through wrong execution of the installation room or fuel storage room

- Boiler room:
  - ☑carry out as defined in the given local fire safety regulations
  - ☑fireproof floor
  - ☑Ensure sufficient supply of combustion air, according to local regulations
  - ☑Ensure protection against wet conditions and frost-proof execution
  - ☑Carrying capacity of the foundation (Weight of the boiler)
- Fuel storage room:
  - ☑Ensure static execution (Weight of fuel)
  - ☑Protection against moisture, water and dust.
  - ☑Ensure dust-proof execution
  - ☑Ensure easy access and easy refill of the fuel storage room
  - ☑Safety devices according to local requirements (TÜB, ETÜ, SLE,...)
  - ☑Fuel storage room - sticker

2 Transport

2.1 Transport weight

The delivery of the heating system is in individually packaged units on pallets.

Term	Weight		Unit
	20-35[kW]	40-60[kW]	
Boiler pallet depending on execution	ca. 500	ca. 570	[kg]
Pallet with stoker unit and agitator system	depending on execution max. 300		[kg]

Unloading, inspection and damage report

After unloading:

- ❒ Remove transport packaging
- ❒ Dispose packaging waste in accordance with law
- ❒ Check all pallets for transport damage
- ❒ Check delivery for completeness
  - ⇨ see “Scope of delivery” on page 6.

In case of an incomplete delivery

- ❒ put down a written record and report to HARGASSNER immediately

If a transport damage occurs

- ❒ put down a written record and take pictures of the damage
- ❒ Send all documents to HARGASSNERRENNERGY
- ☞ If a transport damage occurs, also not it on the documents (delivery note) of the shipping company

2.2 Place of installation

⇨ see “Construction of boiler room” on page 26.

Conditions on site:

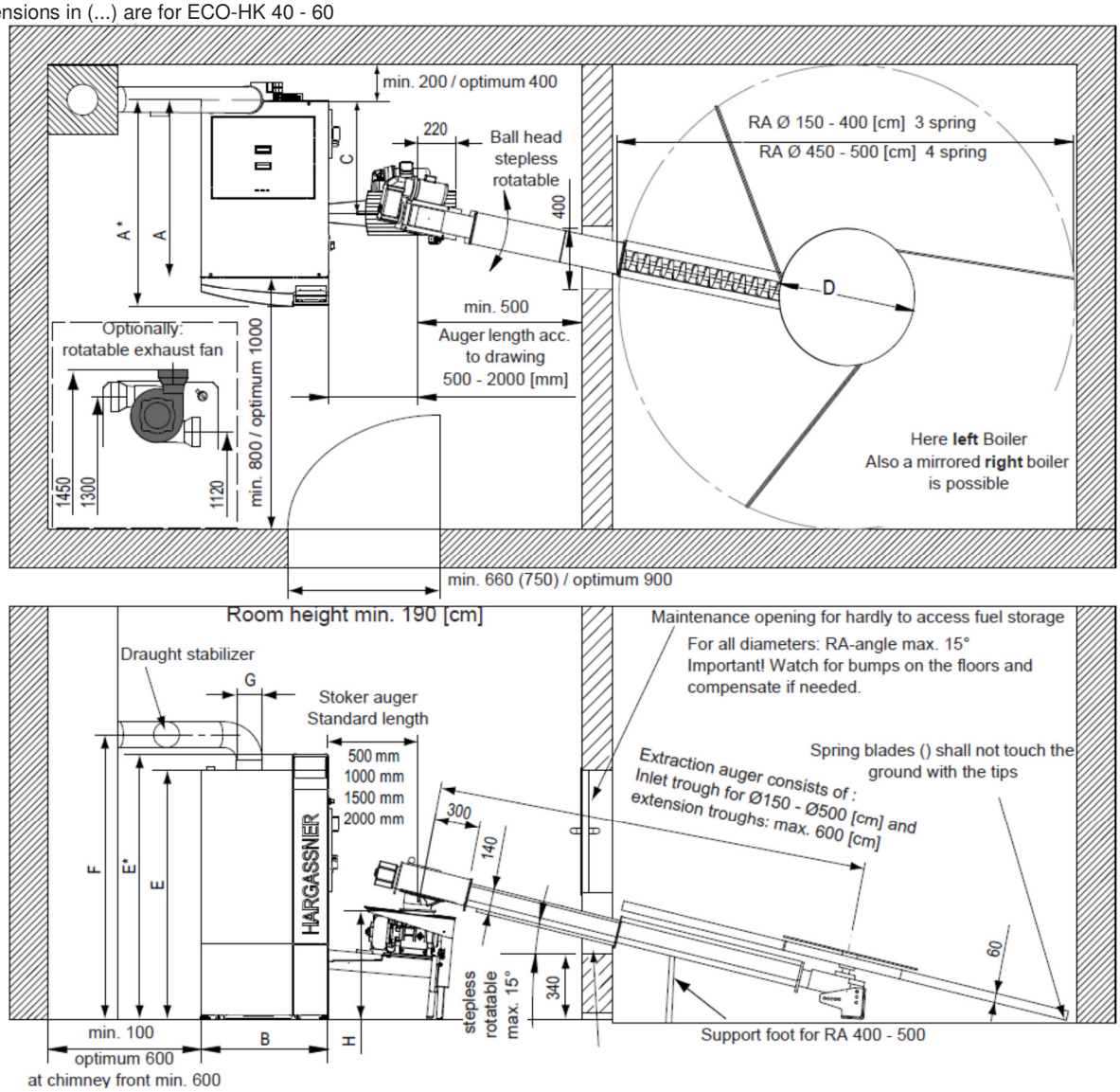
- ☑ sufficient light
- ☑ fireproof, plane and solid floor- and ceiling construction
- ☑ free of disturbing electrical installations and tubes

2.3 Space requirements of the heating system

- ☞ See data sheet or individual customer drawing
  - ☞ Observe minimum space requirements
  - ☞ Drawing of the dimensions required
  - ☞ To access the chimney, 600 [mm] are required

Term	ECO-HK 20-35	ECO-HK 40-60
Room height	min. 190 [cm]	min. 190 [cm]

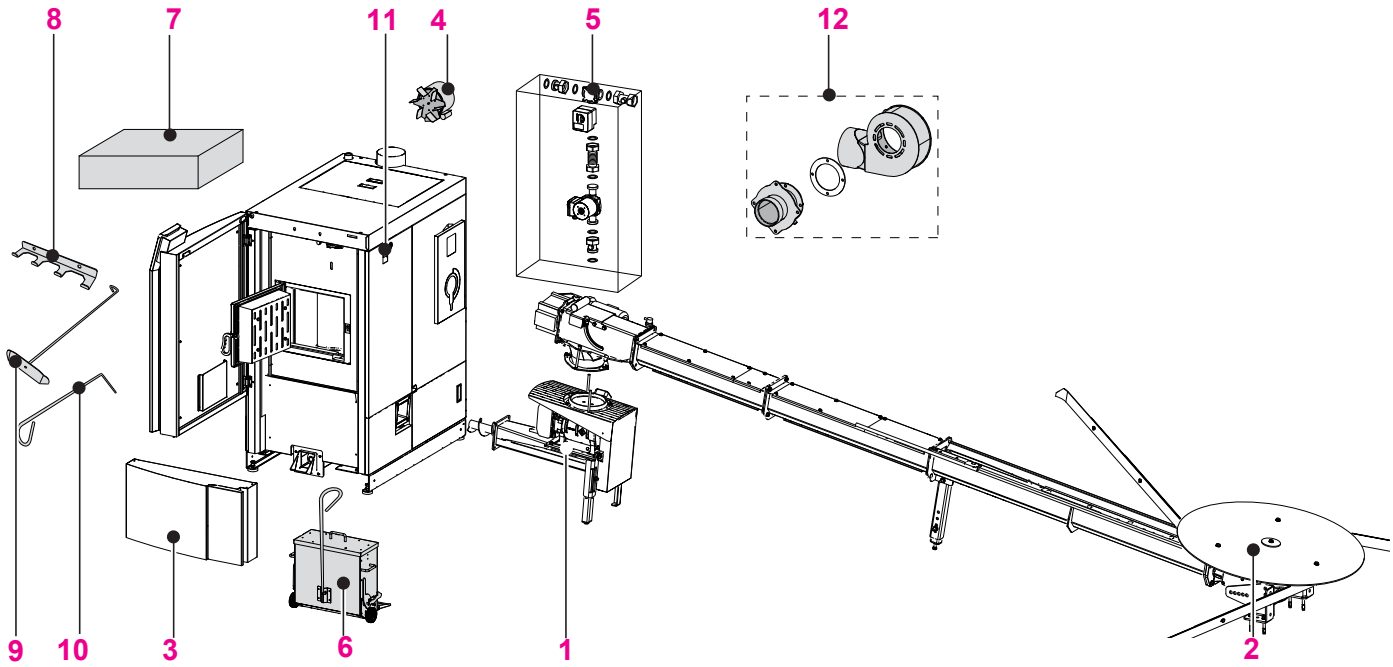
Dimensions in (...) are for ECO-HK 40 - 60



Type			ECO-HK 20 - 35			ECO-HK 40 -60			
Dimensions		Unit	20	30	35	40	45	50	60
Nominal heating output		kW	20	32	35	40	45	49	60
Boiler height *(without/with BCE)*	E / E*	mm	1455/1550			1455/1550			
Boiler width:	B	mm	660			745			
Boiler depth *(without/with door)*	A / A*	mm	940/1220			1025/1310			
Stoker *(Depth/Height)*	C / H	mm	585/610			655/610			
Transport dimensions *(H/W/D)*		mm	1510 x 660 x 1025			1510 x 745 x 1110			
Flue pipe diameter	G	mm	150			150			
Flue pipe connection *(Standard)*	F	mm	1750			1750			
Height Flow connection		mm	1335			1335			
Height Return connection		mm	1150			1150			
Flow and return		Inches	5/4 IG			5/4 IG			
Maximum operating pressure		bar	3			3			
Max. operating temperature		℃	95			95			
Water content		Litre	100			142			
Weight		[kg]	490			560			
Min. draught		[Pa]	5			5			
Electricity supply:			400V AC, 50HZ, 13 A						

3 Scope of delivery

The add-on parts might be packed inside the boiler or on separate pallets.



Pos	Description	Function
1	Stoker unit	Transports the fuel into the combustion chamber ⇨ see “Assembly stoker unit” on page 11.
2	Agitator	Carries the fuel from the fuel storage room into the stoker auger ⇨ see “Room Agitator (RA) assembly and adjustment” on page 13.
3	Additional door panel	Lower part of the front cover door ⇨ see “Mounting the trim panel - Cover door” on page 10.
4	Exhaust gas fan	Transports the flue gas from the boiler into the chimney ⇨ see “Assembly Exhaust fan - motor” on page 10.
5	Back end protection (optionally)	Adjusts a stable return temperature *(packed loose in cardboard)* ⇨ see “Back end protection” on page 32.
6	Ash box	To collect the ash from the combustion process ⇨ see “Ash box” on page 24.
7	Sensor package	Flow-, return-, "Safety temperature breaker" (STB) thermostat, flue gas sensor, lambda sensor, etc., according to sensor pack list
8	Socket companion set	Wall socket for the chimney companion set
9	Ash slider	To clean the boiler
10	Poker	To clean the combustion chamber
11	Main switch	ON / OFF - switch to provide electrical power to the boiler ⇨ see “Mount main power switch” on page 36.
12	Rotatable exhaust fan (optionally)	Transports the flue gas from the boiler into the chimney ⇨ see “Rotatable exhaust fan (optionally)” on page 10.

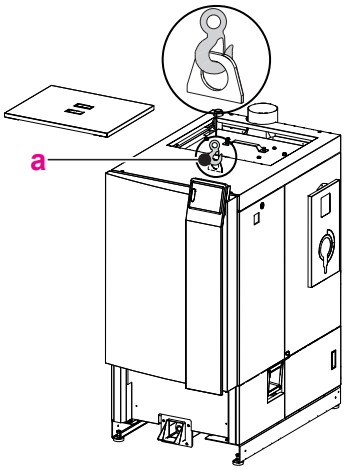
4 Unloading the heating system

D A N G E R

Correct installation

Death, risk of injury, damage from falling loads.

- The installation of the boiler has to be done by trained staff
  - ☞ - from HARGASSNER approved
- only use approved lifting gear
  - sufficient capacity and condition
    - ⇨ Weights see “Transport weight” on page 4.
- Do not exceed the maximum permissible exposure or the forklift truck. See type plate.
- Lock the slings against slipping.
- Do not hang the plant / plant parts, screws, shaft ends or moving parts.
- Never stand under suspended loads!
- At first, lift the plant slowly from the ground
  - ☞ Check that the load attaching points are chosen correctly and sit tight.
    - ☞ Only when the load is taken properly, it is allowed to transport it over longer distances!
- Pay attention to the balance point
  - ☞ Pick-up point at the boiler is not the balance point
    - ☞ Secure against tipping
- Lift the plant during transport with a forklift only as far from the ground that it can be transported safely
- Set up the boiler on a horizontal, even place

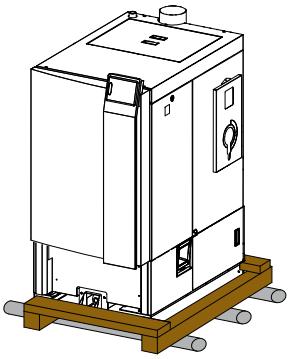


❒ Open the lid of the boiler
❒ Hang in hoist into eyebolt **(a)**.
☞ When lifting focus on balance point
  ☞ Pick-up point at the boiler is not the balance point

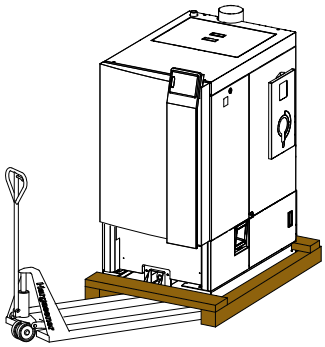
5 Positioning

There are several possibilities to transport the boiler into the boiler room

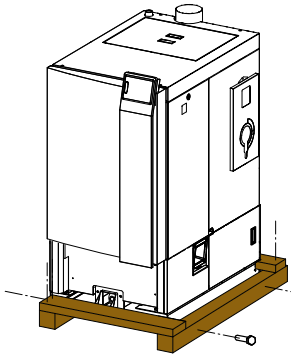
	N O T E
	For a safe transport do not dismantle transport timbers.



❒ Transport boiler via rolls
☞ For a proper rolling performance, use at least 1" tubes



❒ Boiler is transported by a forklift or a forklift truck



❒ Boiler positioning
❒ Unscrew transport timbers from the boiler

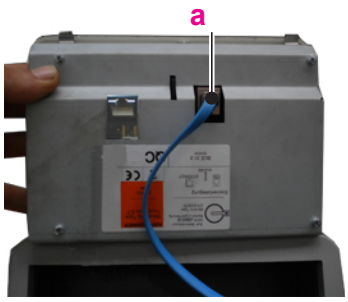
	N O T E
	Tight space conditions at transportation (e.g.: doors, stairway) ❒ Dismantle covering door

5.1 Dismantling cover door

5.1.1 Dismount Touch display (BCE)

❒ Slide touch display upwards until it detaches from the cover.

❒ Tip over touch display and remove from the cover panel

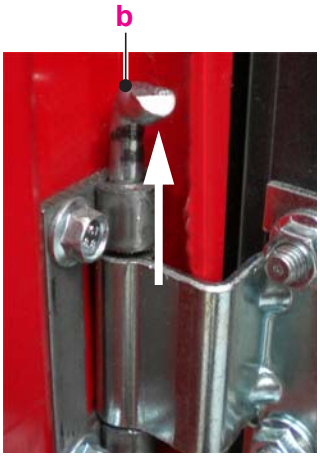


❒ disconnect the BUS-connection **(a)** at the back of the BCE

❒ pull BUS-cable out cover door

❒ Put aside BCE

5.1.2 Dismantle cover door



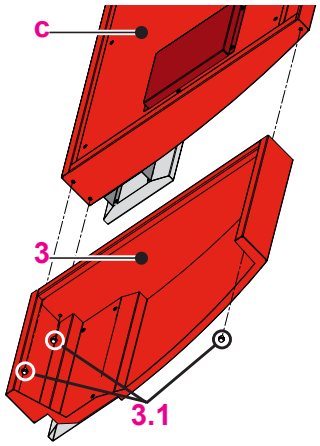
❒ firstly pull lower and then upper hinge **(b)** upwards
☞ Secure door against tipping

❒ Remove cover door and put aside

❒ after the placement of the boiler, the assembly of the cover door takes place in reverse order.
- Hang in door
- Pull in BUS-cable
- Mount touch display

	N O T E
☞	Hargassner recommends to dismantle the cover door also for the assembly of the trim panel.

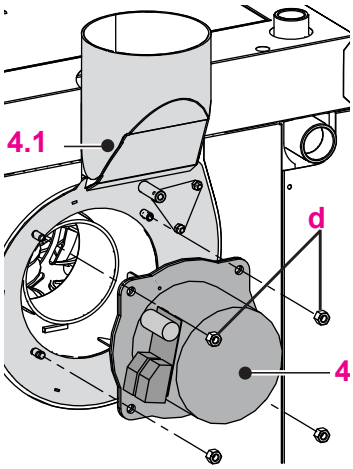
6 Mounting the trim panel - Cover door



❒ Place trim panel **(3)** flush to cover door **(c)**
❒ fix with flange screw M6 x 10 **(3.1)**

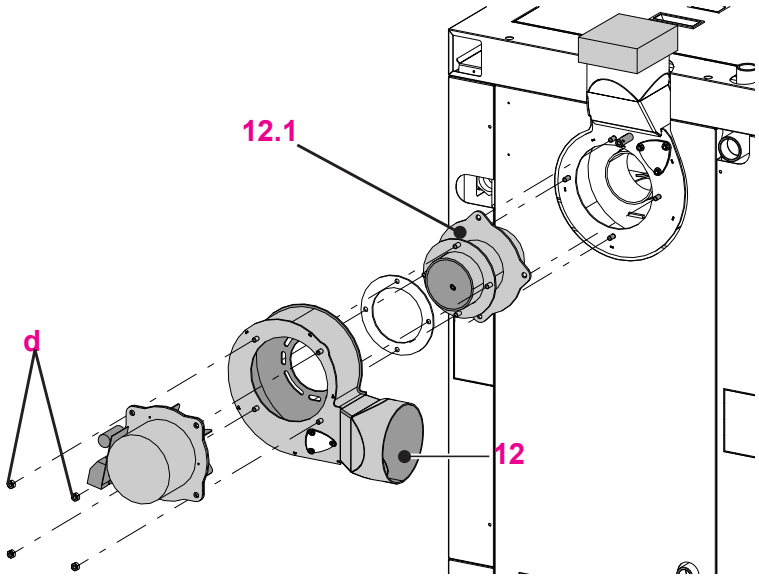
7 Assembly Exhaust fan - motor

7.1 Standard - Exhaust fan



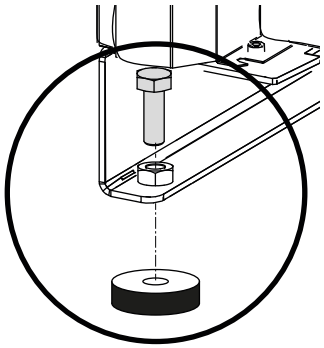
❒ Fix exhaust fan motor **(4)** to exhaust fan housing **(4.1)**
☞ Fan wheel and motor pre-assembled enclosed
❒ Mount motor with 4x copper nuts M8 **(d)** onto the housing
☞ Do not damage the sealing of the exhaust fan motor

7.2 Rotatable exhaust fan (optionally)



❒Fix intermediate piece **(12.1)** onto boiler-sided
exhaust fan housing
❒fix rotatable housing **(12)** on intermediate piece
☞Put sealing in between
❒Mount motor with 4x copper nuts M8 **(d)**
onto the housing
☞Do not damage the sealing of the exhaust fan motor

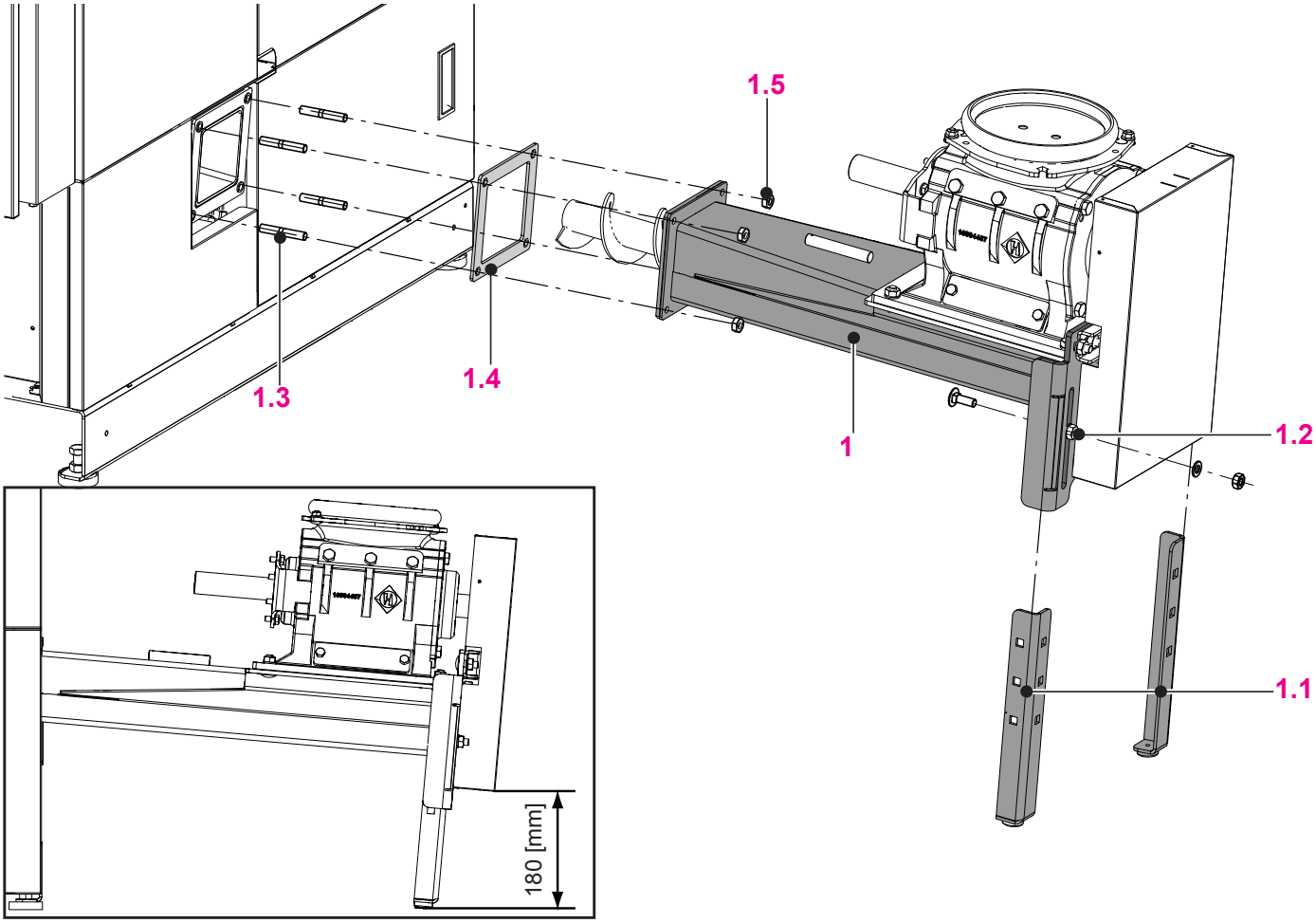
8 Mounting levelling feet



When the boiler is placed at its final position, 4 levelling feet need to be horizontally set.

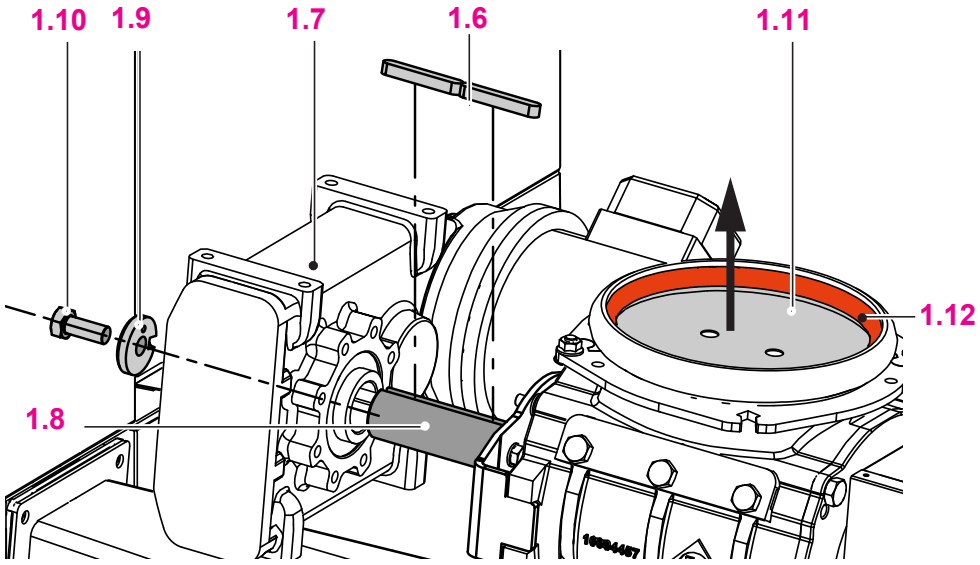
- ❒ Screw hex screw M12x30 from top into the boiler body
- ❒ Place levelling feet under screws
- ❒ Lower boiler onto levelling feet
- ❒ Align boiler with screws

9 Assembly stoker unit



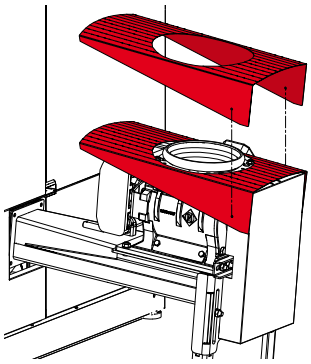
- ❒ Insert the two adjusting feet **(1.1)** and fix
  - ☞ Fix them according to the floor
  - ☞ Distance to the floor: 180 [mm]
  - ☞ Round head screw M10x30, washer M10 and hex nut M10 **(1.2)**
- ❒ Screw in 4x stud bolt M8 x 20 (Total length 30 [mm]) **(1.3)** with **short thread side** (thread length 10 [mm]) to boiler flange
- ❒ Insert **(1.4)** seal
- ❒ Fix stoker unit **(1)** to boiler flange
  - ☞ 4 x hex nut M8 **(1.5)**

9.1 mounting the motor of the stoker unit



- ❒ Place 2 feather keys 10x8x60 **(1.6)** on rotor shaft of the rotary valve
- ❒ Plug motor with gear box **(1.7)** onto shaft of the rotary valve **(1.8)**
  - ☞ Motor pointing to boiler back side
- ❒ Fix motor on shaft with large washer **(1.9)** and hex screw M12 x 30 **(1.10)**
- ❒ Remove ring-seal **(1.12)** from ball socket
- ❒ Remove transport protection **(1.11)** from rotary valve
- ❒ Reinstate ring-seal again

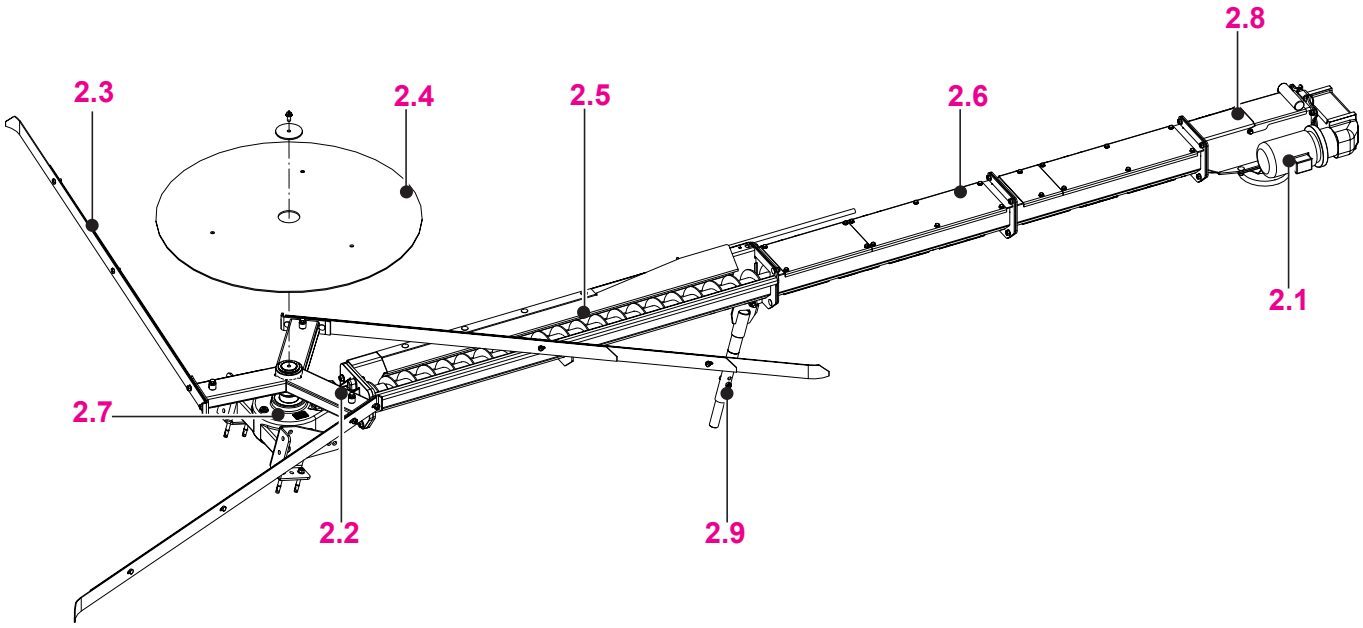
9.2 Mount rotary valve design cover



- ❒ Loosen 2x fastening screws from the motor protective cover
  - ☞ Do not remove protective cover from motor
- ❒ Place rotary valve design cover
- ❒ Fix 2x fastening screws

10 Room Agitator (RA) assembly and adjustment

10.1 Overview Agitator (RA 140/160)

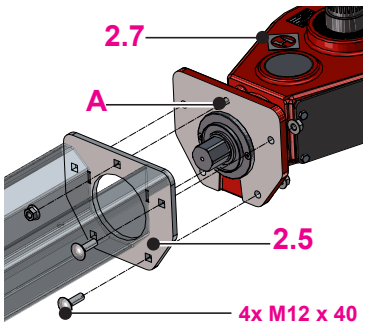


Pos	Description	Function
2.1	RA - Motor	Drives the spring blades and the extraction auger
2.2	Turnstile	Fixing the spring blades
2.3	Spring blades	Carry the fuel into the extraction auger
2.4	Cover plate	Hides spring blades underneath
2.5	Inlet trough auger extensions	Carries the fuel
2.6	Auger extensions (delivery channel with auger)	Carries the fuel
2.7	RA - Gearbox with stabilizer	Drivers spring blades
2.8	RA - Head with auger	Carries the fuel into the stoker auger
2.9	Gearbox stabilizer	Stabilizes the gearbox

10.2 Delivery channel assembly

☞ Remove augers and covers prior assembly

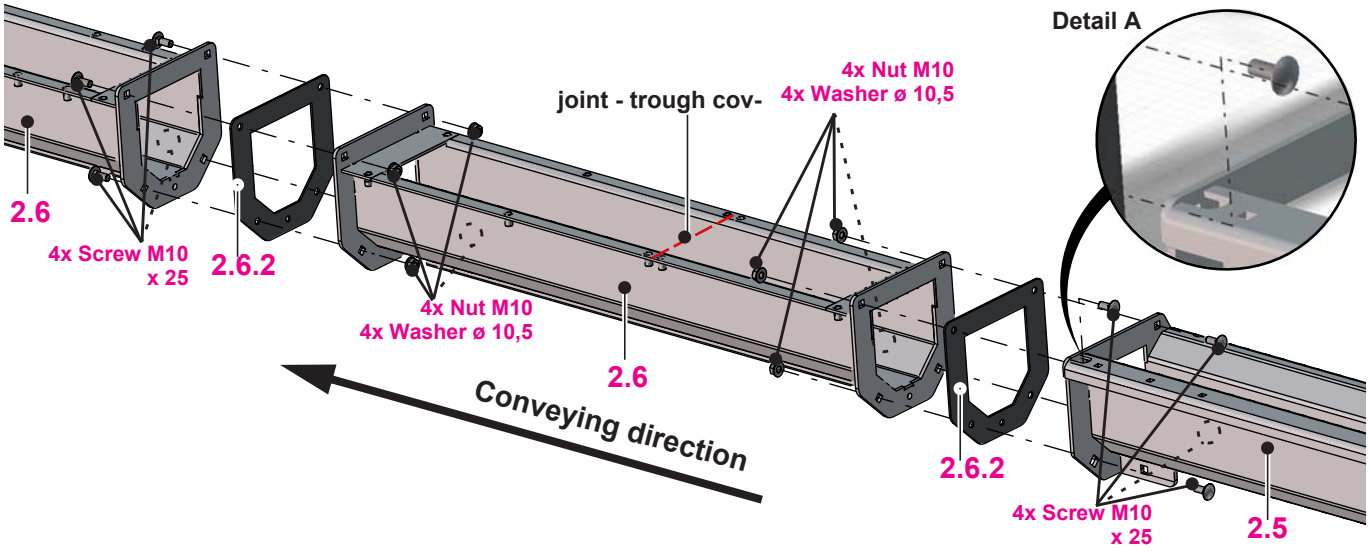
10.2.1 Gearbox –Trough Assembly



❒ Connect gearbox **(2.7)** with inlet trough **(2.5)**
  ❒ Place inlet trough with hex. nut M12 on the threaded bolt **(A)**
  ❒ 4 x Flat round screw M12 x 40 and 4 x Hex nut M12
    ☞ Mount screws with screw head on side of the trough

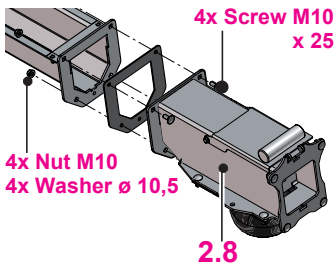
10.2.2 Trough assembly

❒ Place the troughs according to the customers drawing on the floor



❒ Place extension trough **(2.6)** correctly at the inlet trough **(2.5)**
  ☞ The joint of the trough covers should not be placed in the wall opening
❒ Place sealing **(2.6.2)** between troughs
❒ Screw the troughs
  ☞ 4 x flat headed screw M10 x 25
    4 x hex. Nut M10 and 4 x Washer ø 10,5 [mm]
  ☞ Screw direction see **Detail A**

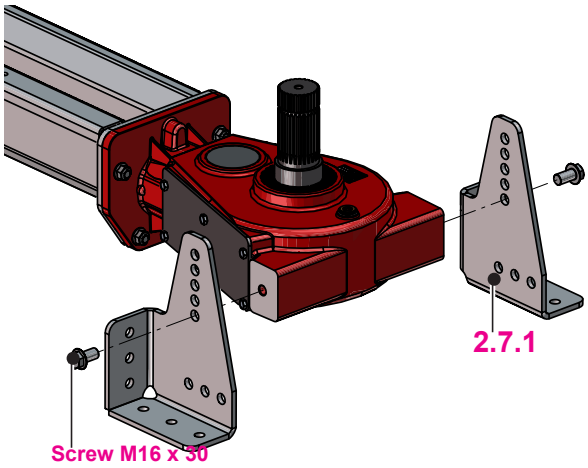
10.2.3 RA - Head assembly



❒ Mount head part **(2.8)** at the last trough
  ☞ 4 x flat headed screw M10 x 25
    4 x hex. Nut M10 and 4 x Washer ø 10,5 [mm]

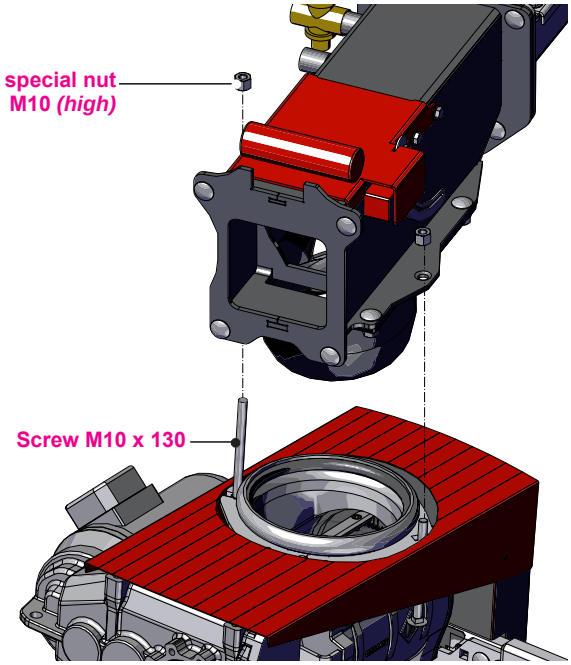
☞ for an easier assembling, ask for a second worker

10.2.4 Mount floor stabilizer



❒Mount floor stabilizer **(2.7.1)** at the RA - gearbox
☞Place stabilizer vertical at the bottom hole with flange screw M16x30 and tighten slightly

10.2.5 place agitator on stoker unit

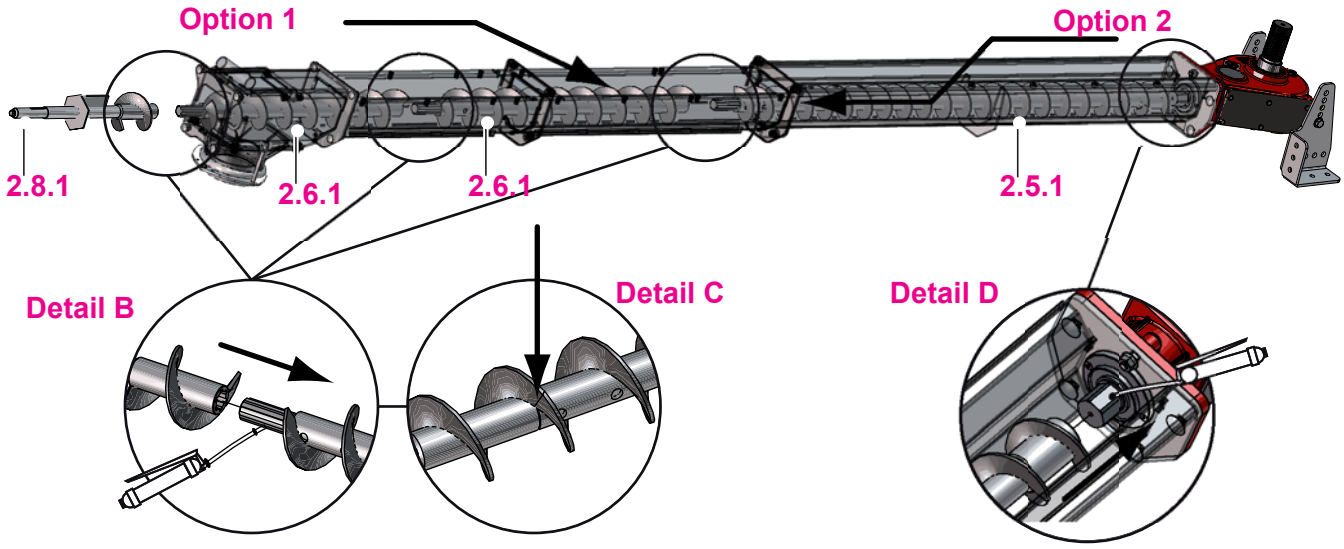


☑second worker needed
❒Mount head part onto ball socket
☞in between a downpipe or connection auger can be mounted

❒Round-head screw M10 x 130, placed from below upwards into the tension clamp
❒Place ball head onto the ball pan of the stoker panel and fix slightly
☞with screw M10 x 130 and special nut M10 (high; retrieved side down)

☞the agitator can also be connected to the stoker unit after the installation of the extension augers (see “Installation of the augers into the auger channel” on page 16.)
(not recommended)
↳more difficult positioning of the agitator due to the additional weight of the extension auger parts

10.2.6 Installation of the augers into the auger channel



Hint:
Align the winding ends of the augers to the top, as it is easier to check the exact flush

Option 1:

❒ Insert the augers from top into the auger channel

☞ Sequence for the insertion:

- Auger of the inlet trough **(2.5.1)**
- auger of the extension trough(s) - (depending on execution) **(2.6.1)**
- Top-auger from the head **(2.8.1)**

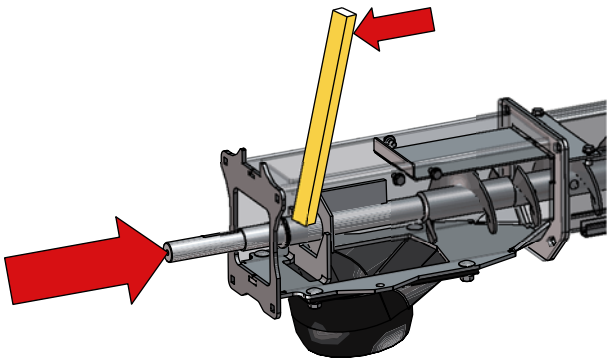
Option 2:

❒ Insert the augers from the back into the auger channel

☞ Sequence for the insertion:

- auger of the extension trough(s) - (depending on execution) **(2.6.1)**
- Auger of the inlet trough **(2.5.1)**
- Insert Top-auger from the head **(2.8.1)** in the front

☞	**N O T E**
	Prior assembly of the different auger parts, **all** auger connections have to be lubricated with grease. ⇨ See „Detail B“ and „Detail D“ Turns of the auger must be flush. ⇨ See „Detail C“

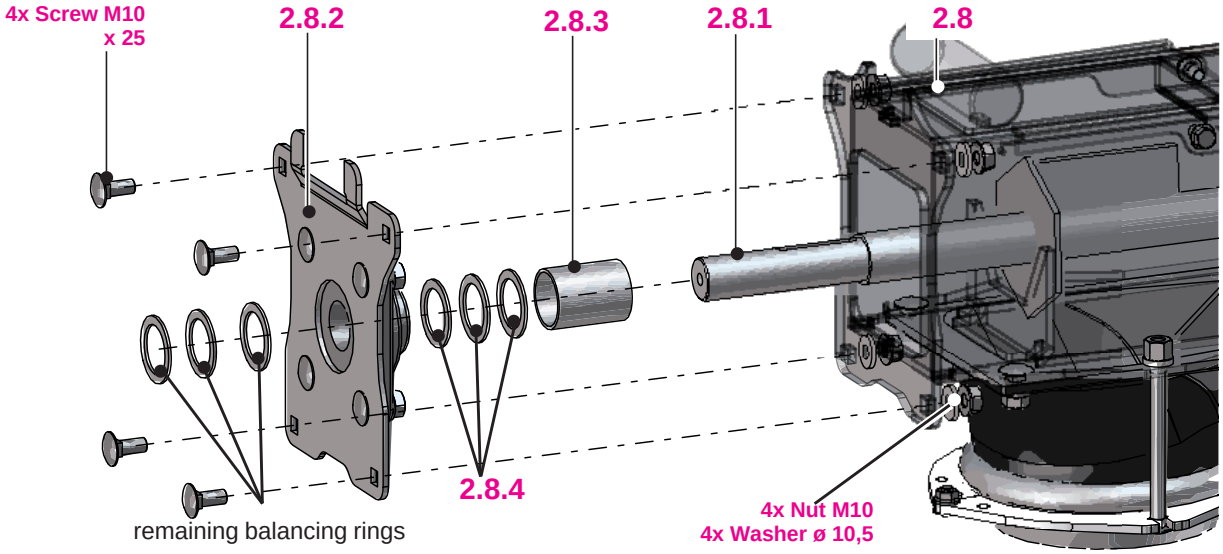


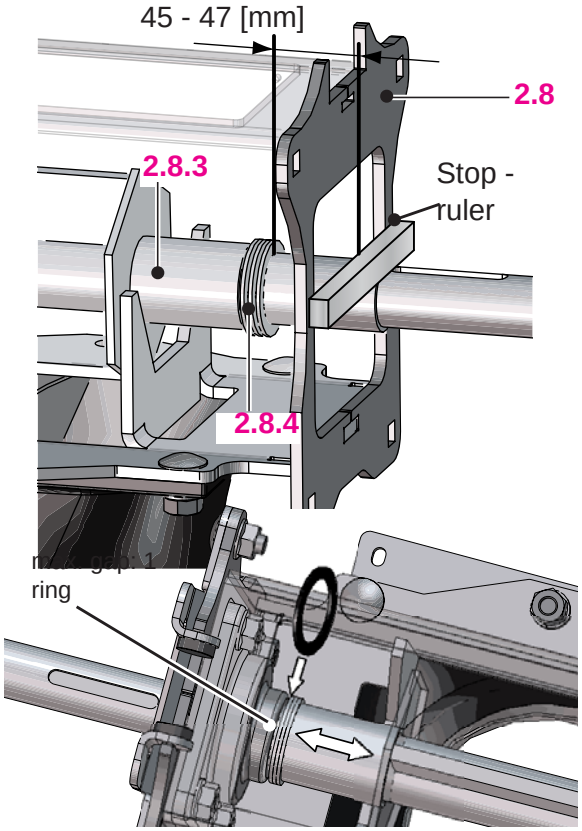
To ensure complete connection of the auger parts push
the final part of the auger
Hint:
push the auger parts with a timber

☑ check the connection points of auger parts

⇨ See „Detail C“ and „Detail D“

10.2.7 Assembly of the bearing plates





❒Move test sleeve **(2.8.3)** and balance rings **(2.8.4)** onto the shaft **(2.8.1)**

☞take 3 pcs. balance rings

❒Check distance to the balance rings
45 - 47 [mm]

☞Adjust distance with the number of balance rings

❒Secure bearing plate **(2.8.2)** with 4 x flat head screw M10 x 25;
Mount 4 x hex. Nut M10 and 4 x Washer ø 10,5 [mm] at head **(2.8)**

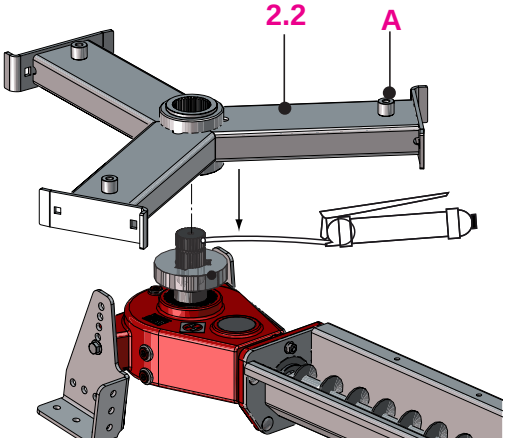
❒check free movement of test sleeve **(2.8.3)**

☞Test sleeve has to move easily
(max. gap: 1 balance ring 2 [mm] clearance)

❒Place the remaining balance rings at the outside of the shaft

☞to prevent losing

10.2.8 Mounting the turnstile



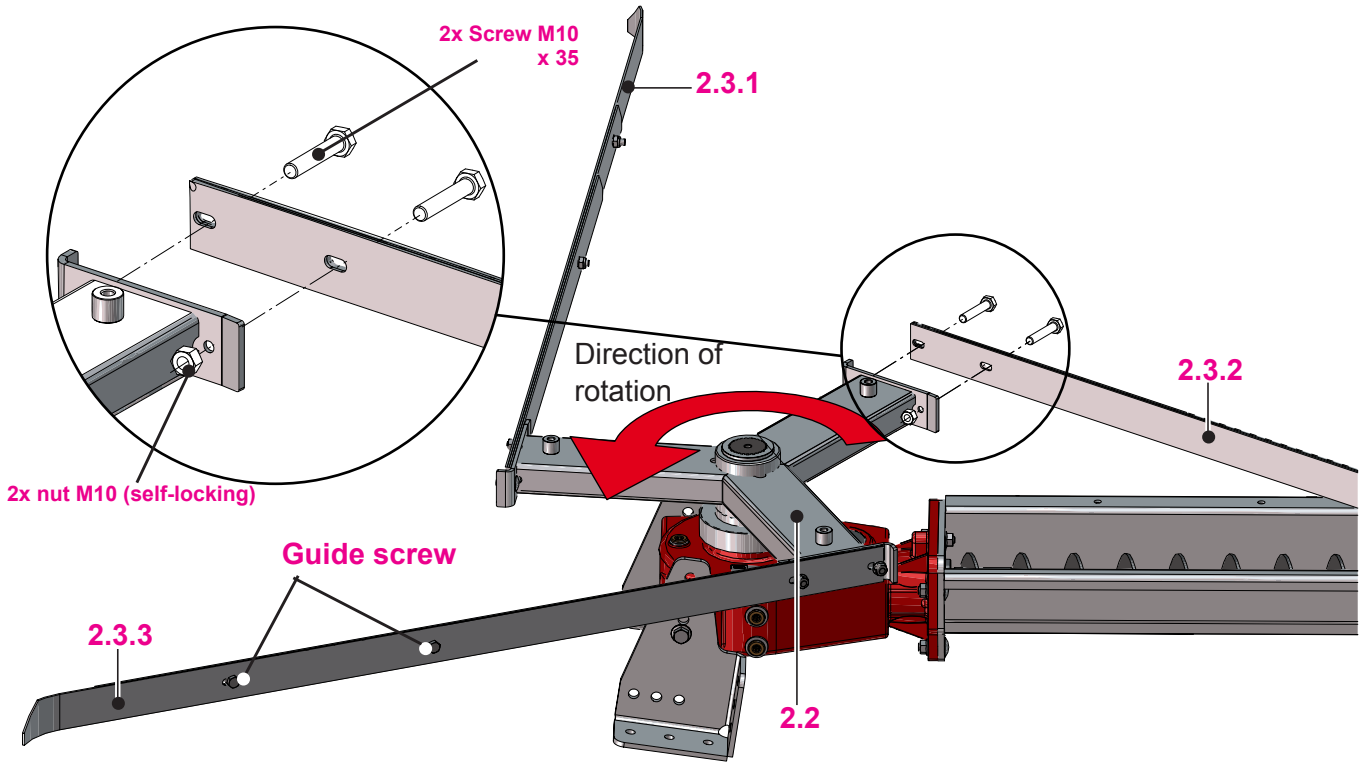
❒Attach 3 - pod turnstile **(2.2)** with threaded sleeves **(A)** on top to the shaft of the gearbox

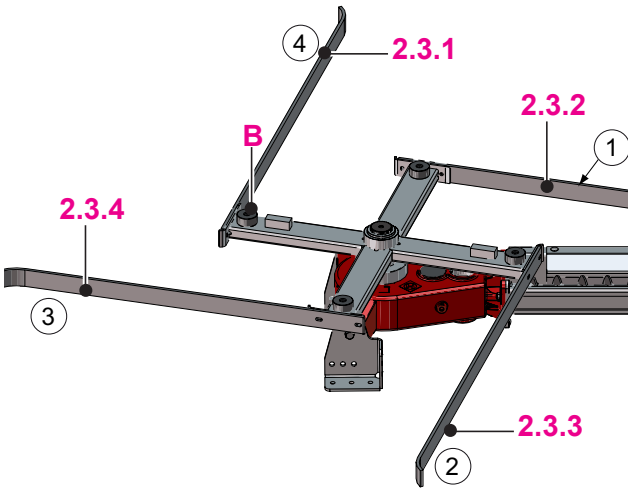
☞Attach 4-pod turnstile with sliding jaws **(B)** on topside

☞grease output shaft before assembling

10.3 Mounting spring blades

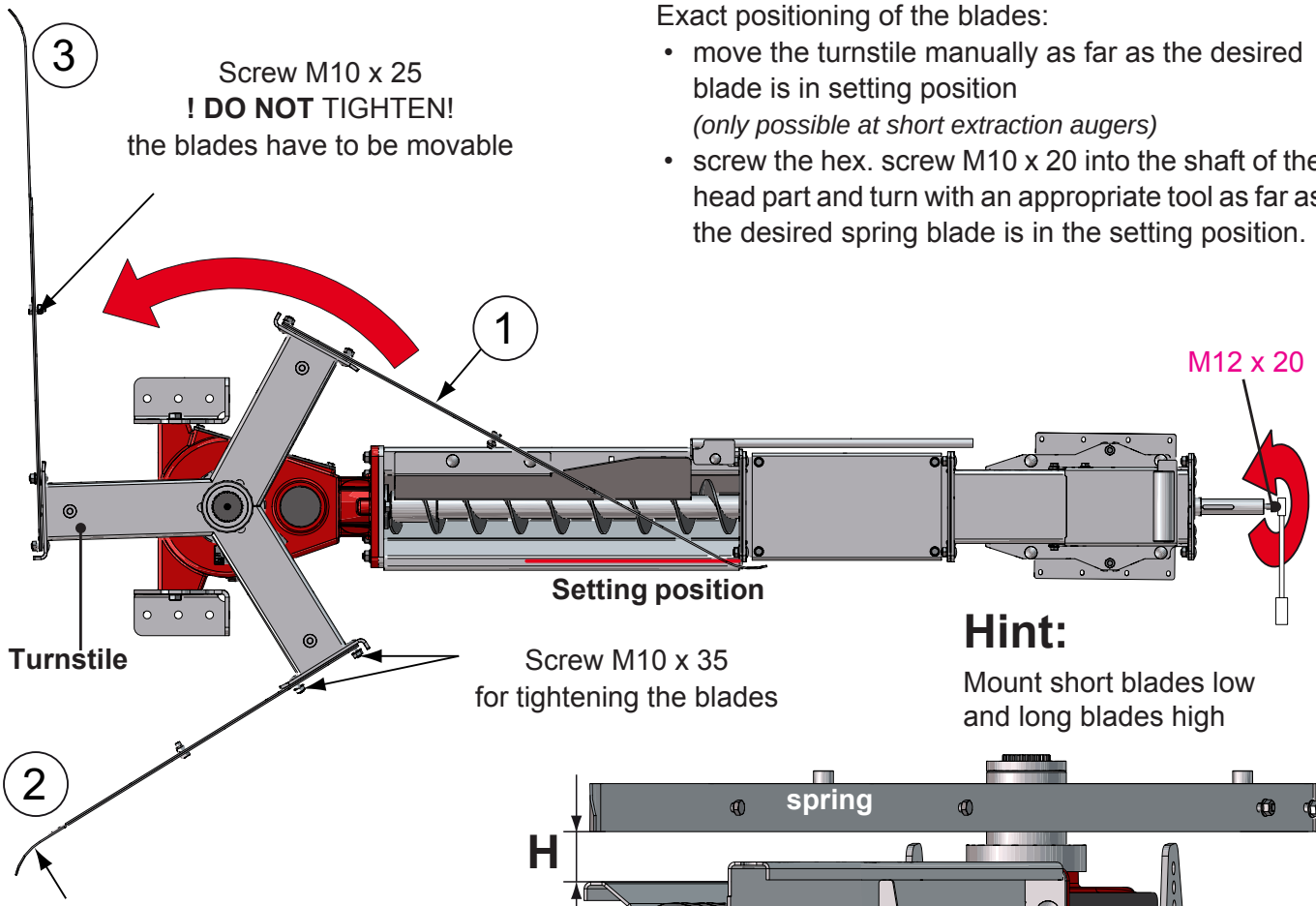
	ATTENTION
	<u>place spring blades correctly.</u> **<u>Do not tighten main screws of the spring blades!</u>** **Place the spring blades at the correct position** • The diameter of the agitator defines the length, the position and the height of the spring blades. ☞ Due to the varying lengths of the spring blades (at RA350 - 500)an efficient extraction of the fuel out of the storage room is guaranteed. • **Do not tighten main screws of the spring blades** ☞ The individual spring blades should have free space.





❒Screw spring blades **(2.3.1 - 2.3.3)** at the turnstile **(2.2)**
☞RA 150 - 400 **3 spring blades (2.3.1 - 2.3.3)**
☞RA 450 - 500 **4 spring blades (2.3.1 - 2.3.4)**
☞Mount 2 x hex screw M10 x 35 and 2 x Self-locking hex nuts M10
☞Pay attention to the right position and the right length of the spring blades
⇨see “Setting the spring blades” on page 19.
☞Mount spring blades with paddles out
↳Spring blade paddles show in direction of rotation

Setting the spring blades

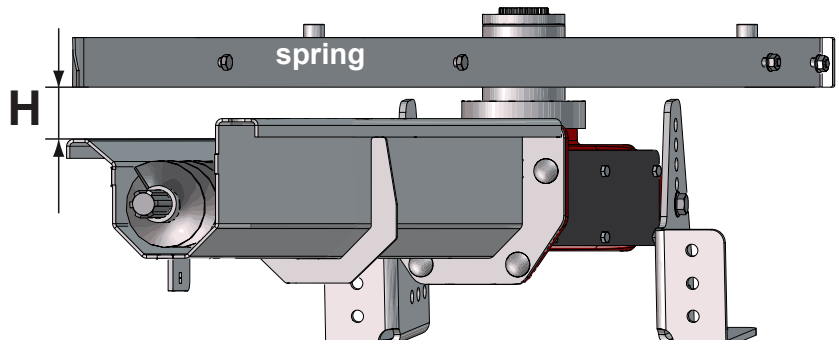


Exact positioning of the blades:

- move the turnstile manually as far as the desired blade is in setting position
  (only possible at short extraction augers)
- screw the hex. screw M10 x 20 into the shaft of the head part and turn with an appropriate tool as far as the desired spring blade is in the setting position.

Hint:

Mount short blades low and long blades high



RA 150 - 200			
ø	**Spring blade**	**Length**	**Gap H [mm]**
150	1 - 2 - 3	770	65
200	1 - 2 - 3	1040	65

Cover plate: ø 840 [mm]

Cover plate: ø 610 [mm] - 3-pod

RA 250 - 400			
ø	**Spring blade**	**Length**	**Gap H [mm]**
250	1 - 2 - 3	1280	65
300	1 - 2 - 3	1550	65
350	1	1550	30
	2 - 3	1800	65
400	1	1800	30
	2 - 3	2050	65

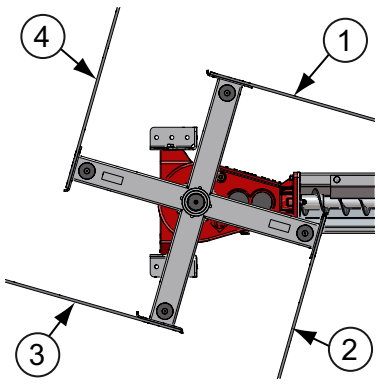
Cover plate: ø 990 [mm]

Cover plate: ø 710 [mm] - 3-pod

RA 450 - 500			
ø	**Spring blade**	**Length**	**Gap H [mm]**
450	1 - 3	2050	30
	2 - 4	2280	85
500	1 - 3	2280	30
	2 - 4	2560	85

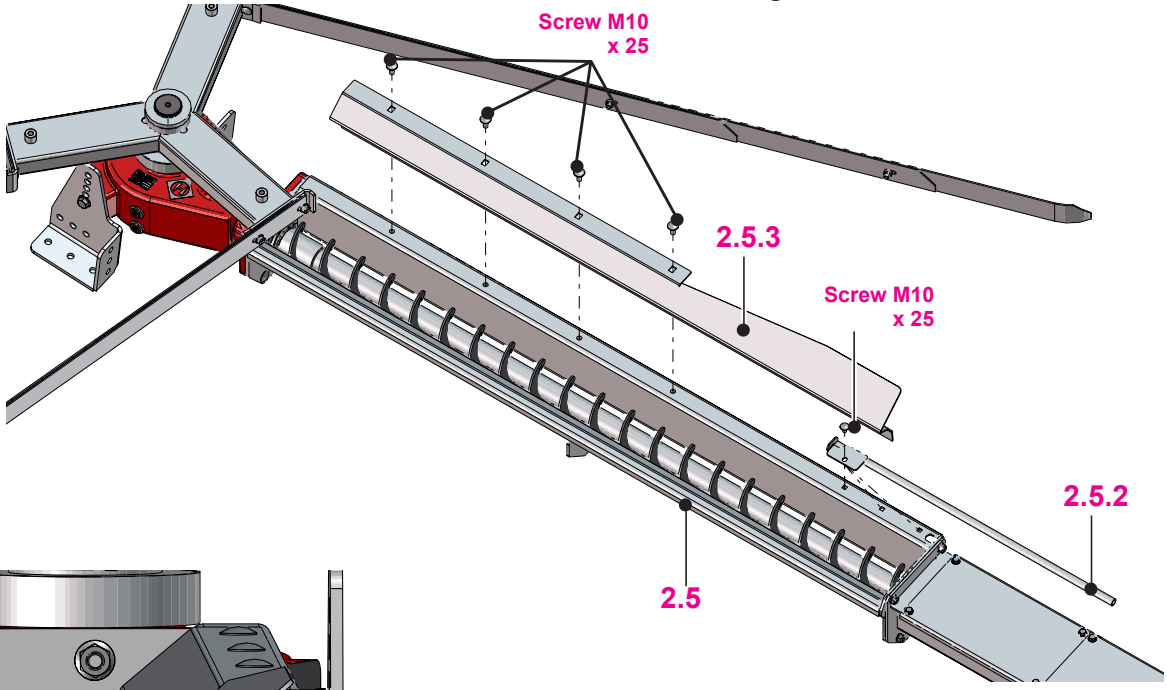
Cover plate: ø 1300 [mm]

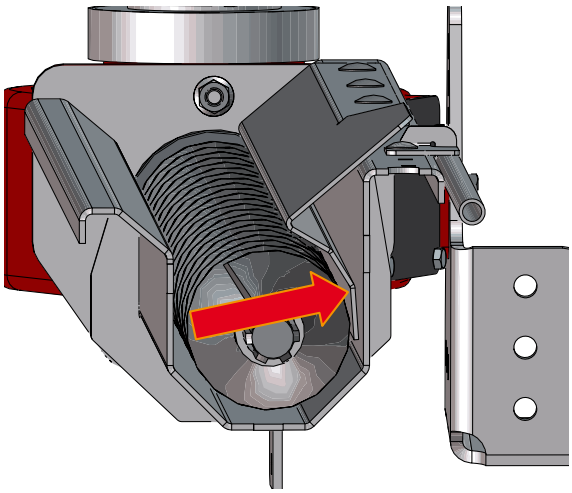
Cover plate: ø 992 [mm] - 4-pod



10.4 Auxiliary trough equipment (Inlet metal sheet, trough covers and sensor tube)

10.4.1 Inlet metal sheet and TÜB-sensor tube at the inlet trough

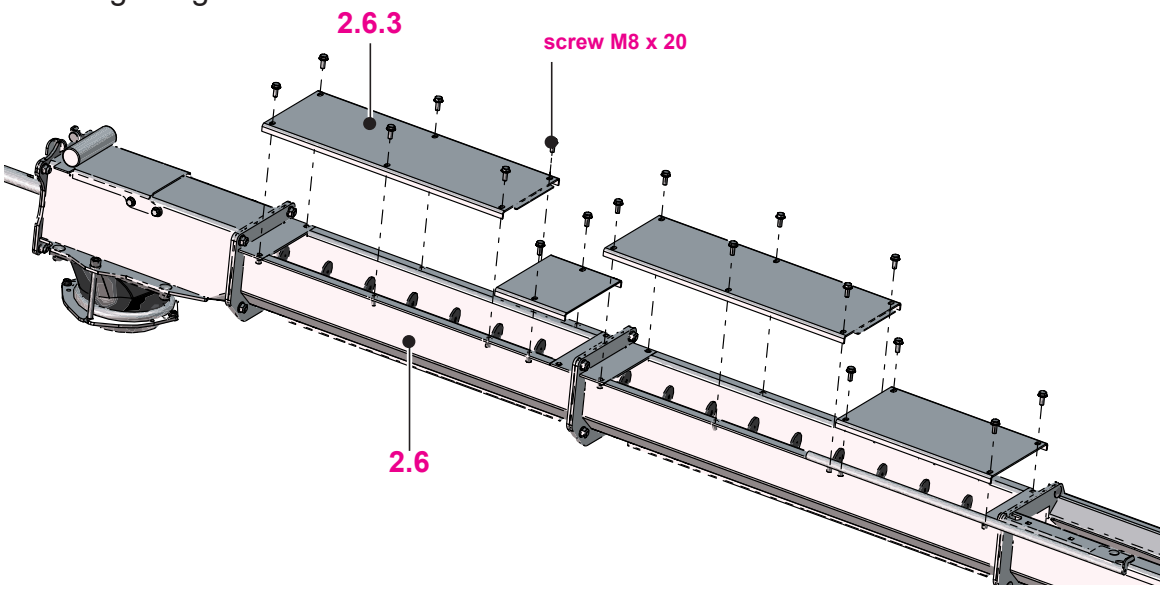




❒Mount TÜB – sensor tube **(2.5.2)** at the inlet trough **(2.5)**
- ☞flat head screw M10 x 25 and nut M10
- ☞Select assembling position, depending on wall thickness

❒Mount inlet metal sheet **(2.5.3)** at the inlet trough **(2.5)**
- ☞flat head screw M10 x 25 and nut M10
- ☞take care that the inlet metal sheet touches the lateral wall of the auger trough

10.4.2 mounting trough covers

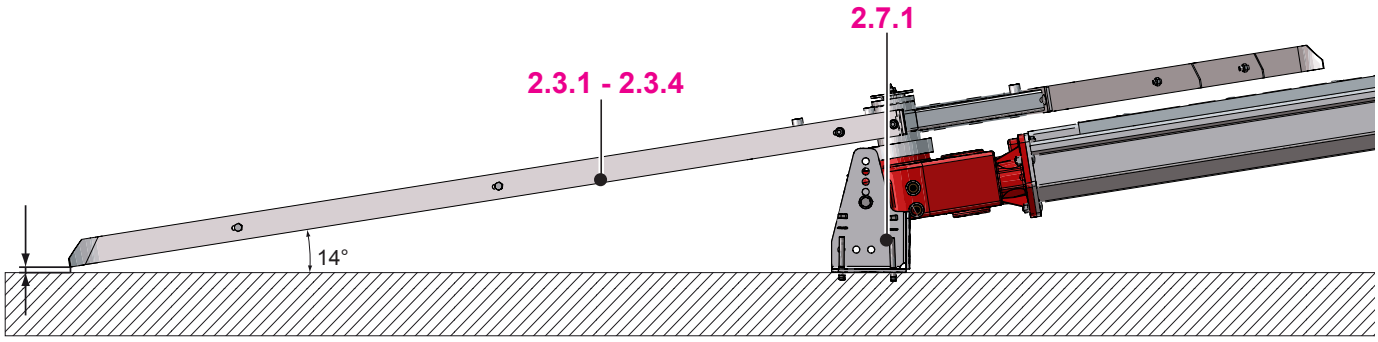


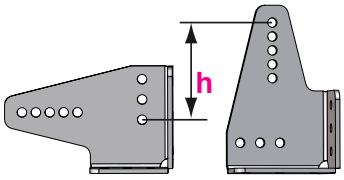
❒ Mount trough covers **(2.6.3)** onto the extension troughs **(2.6)**
- ☞ flat head screw M8 x 20 *(amount depending on size of cover)*

☞ The joint of the trough covers should not be placed in the wall opening

10.5 Secure RA - gearbox at the floor

☞	N O T E
	check the height adjustment and the correct position of the RA - gearbox prior securing the gearbox top the fuel storage room.



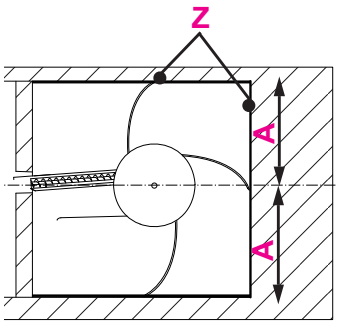


☑ spring blades **(2.3.1 - 2.3.4)** may not touch the ground with the tips

☞ If the ground is touched, the stabilizer **(2.7.1)** has to be changed in height **(h)**

☑do not exceed the maximum angle of the agitator system

☞adjust height as required (stabilizer can be used horizontally or vertically)



☑Pay attention that non of the spring blades touches the wall

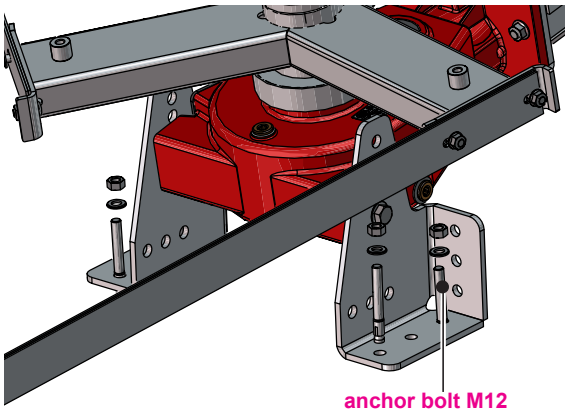
☞ If a connection of the blades and the wall can not be avoided

↳ center agitator in the fuel storage room **(layout A-A)**, so that the bending of the spring blades on the wall takes place unifomly.

☞ on the wall with the wall opening the blades may not touch

☞ to protect the wall, install a wooden board or a metal sheet **(Z)** between spring blades and the wall

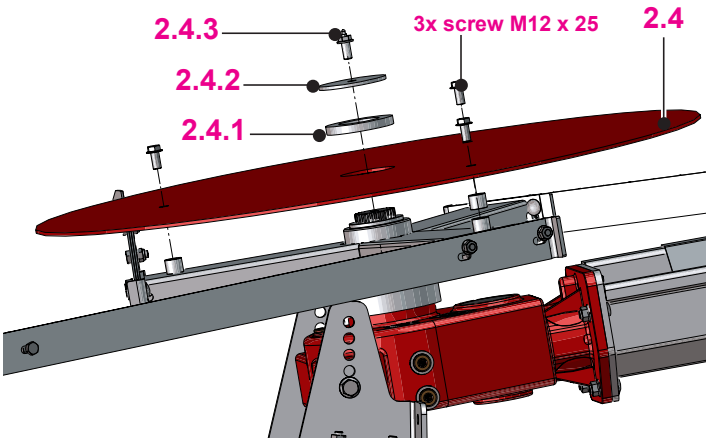
❒ after positioning the agitator correctly, secure the stabilizer of the RA - gearbox to the floor



❒anchor the agitator in the fuel storage room with the stabilizer **(2.7.1)** on the floor

☞4 x anchor bolt M12

10.6 mounting the 3-pod cover plate



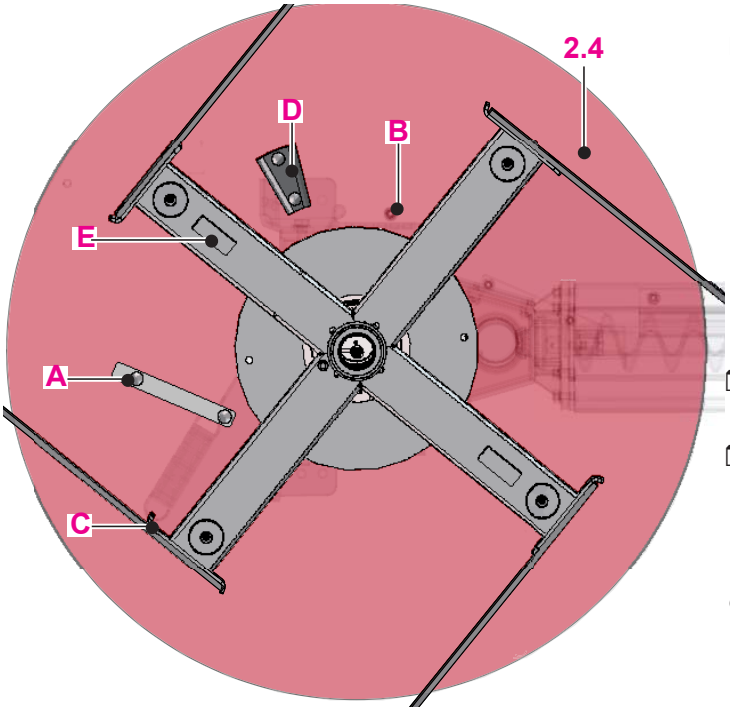
❒Attach cover plate **(2.4)** to the shaft of the agitator- gearbox
- ☞Align the cover plate to the turnstile and secure it with M12x 25

❒Add balancing disc **(2.4.1)** to the shaft of the agitator gearbox

❒fix cover plate together with grease screw **(2.4.3)** and washer disc **(2.4.2)** to the shaft

☞Lubricate with grease gun *(1 x annually)*

10.7 mounting the 4-pod cover plate



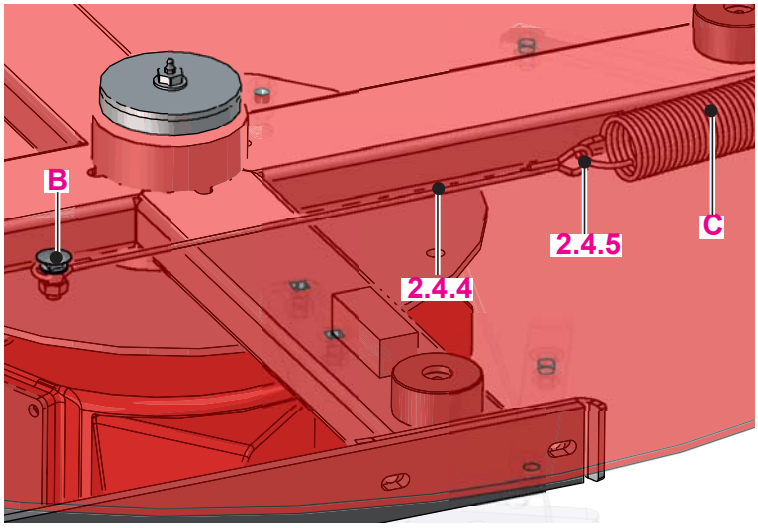
❒Attach the cover plate **(2.4)** onto the shaft of the gear box
- ☞align the cover plate, including brake shoes **(A)** on top, to the turnstile
- ☞Place fixing point **(B)** of the cover plate spring return **opposite** the turnstile pod no. **(C)**
- ☞Stop point**(D)** of the cover plate behind the turnstile stop point **(E)**

❒Add balancing disc **(2.4.1)** to the shaft of the agitator gearbox

❒fix cover plate together with grease screw **(2.4.3)** and washer disc **(2.4.2)** to the shaft

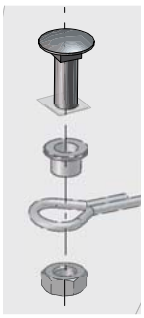
☞Lubricate with grease gun *(1 x annually)*

10.7.1 Mounting the spring return



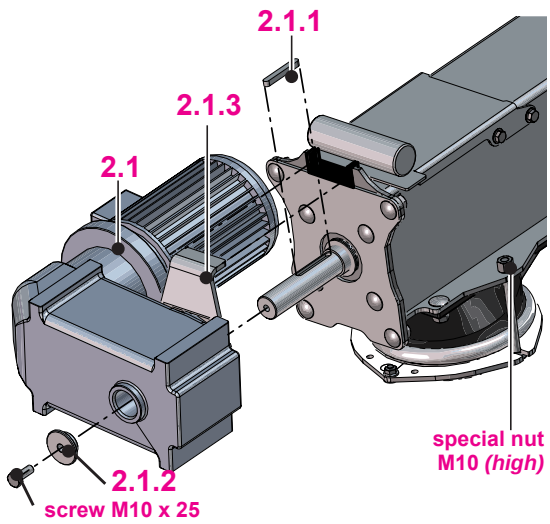
❒Insert spring**(2.4.5)** on the turnstile pod No. **(C)**

❒Mount steel cable **(2.4.4)** on the attachment point **(B)**
- ☞flat head screw M10 x 30, flange adaptor and nut M10
- ☞mount flange adaptor with flang in direction of the cover plate



❒Hang in steel cable **(2.4.4)** on the other end to the spring

10.8 Installation of the RA-motor

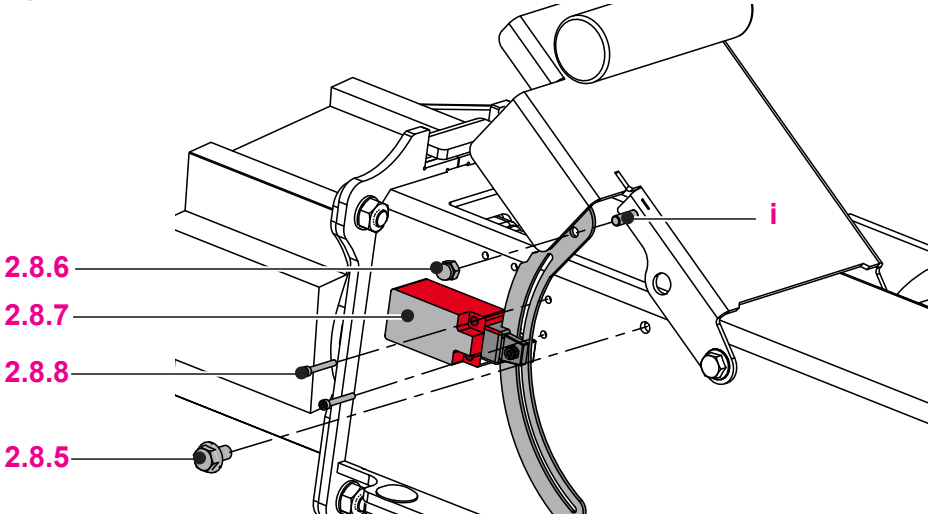


❒Insert feather key **(2.1.1)** into the end of shaft
☞grease shaft end
❒Attach RA - motor **(2.1)** to the shaft end
☞Torque arm**(2.1.3)** must be placed into the gap of the bearing plate
❒Secure the motor with disc **(2.1.2)** and screw M10 x 25

RA - Motor	
Power	**auger length**
0,18 [kW]	less than 5 [m]
0,25 [kW]	from 5 [m]

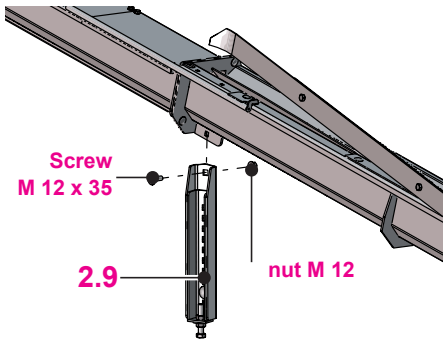
❒tighten ball head with clamp manually by hand

10.9 mounting the limit switch



❒ Undo hex cap-nut M6 **(2.8.6)** and flange screw M6 **(2.8.5)**
❒ Put bow with anchor point to threaded bolt M6 **(i)** and fix with hex cap-nut M6 **(2.8.6)**
❒ Fix switch to head part horizontally
☞ 2 x allen screw M5 x 25
❒ Close RA-cover completely and refix flange screw M6 **(2.8.5)**

10.10 Mounting the trough support foot *(only at RA 400 - 500)*



❒mount support foot **(2.9)** at the inlet trough of the fuel
☞Flat head screw M12 x 35 and hex nut M12

☞Hargassner recommends for very long augers, to implement an additional support foot on site.

11 Ash box

11.1 Installation ash box - flange

1. Open cover door

2. Place flange onto boiler correctly

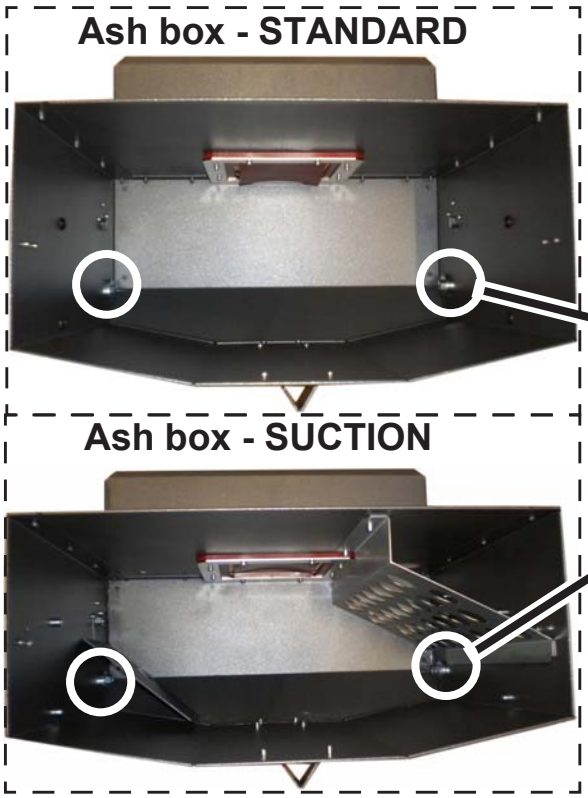
3. Fix flange with 4 pcs. ISK M6 x 16 (in ECO-HK screw package)

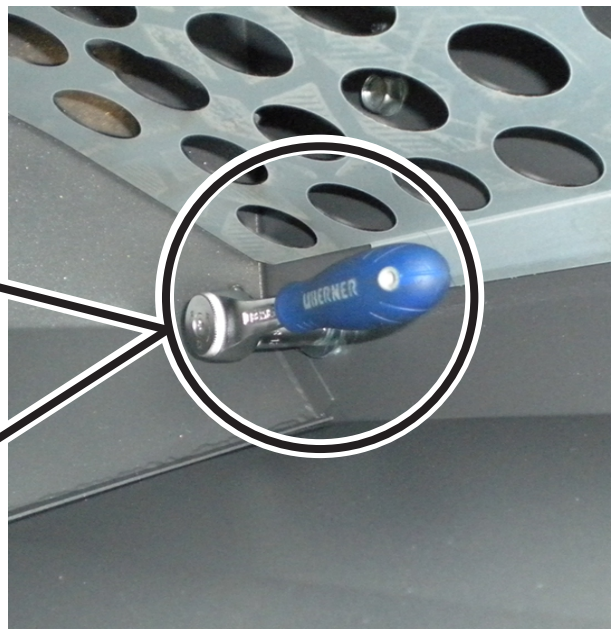
11.2 Adjust ash box - wheels

1.

Place ash box onto boiler correctly

2.

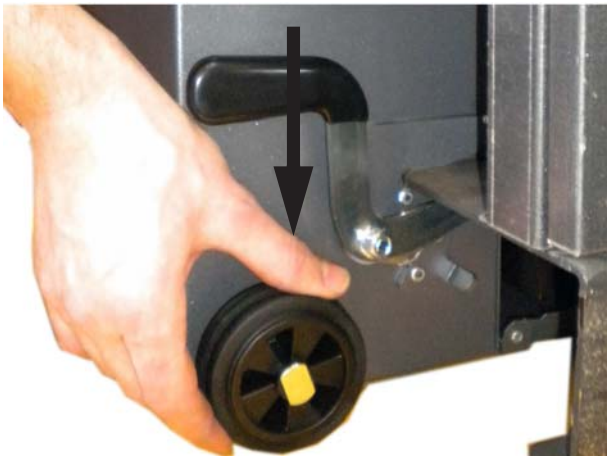




2 x

Loosen nut M8 (SW13)

3.



Press wheel tight onto the floor and refix nuts

similar at other side

12 Facilities on site

12.1 Consider federal state laws and public safety regulations

ATTENTION

Observe federal safety regulations

The rules and safety regulations for the operation of biomass heating systems and storage of fuels can be different in your country.

- Check government regulations prior commissioning of the heating system.
  - ☞ Fire protection
  - ☞ Operation of heating systems
  - ☞ Storage of heating fuels
  - ☞ Construction requirements for boiler rooms and fuel storage rooms
  - ☞ Requirements from chimney sweep

12.2 Qualification of installation staff

CAUTION

Installation through qualified, authorized and experienced staff only!

Death, injury, damage through inappropriate installation.

- Construcion works regarding statics, electrics, hydronics, components of flue gas system and fire protection only through authorized staff.
- The system operator is obliged to allow the test of the exhaust system and the fire protection of licensed authorized agencies.

In addition to the operation manual and the mandatory regulations for accident prevention in the country, where the system is installed also the technical rules for safety and proper installation has to be considered.

12.3 Construction of boiler room

- ☞ Boiler room must be executed according to legislation in your country.
- ☞ fireproof, plane and solid floor- and ceiling construction
- ☞ free of disturbing electrical installations and tubes

12.3.1 Austrian regulations

- ☑ Country-specific boiler room regulation
- ☑ Ö-Norm M7510 (Inspections of heating systems of solid fuels)
- ☑ TRVB H 118 (Wood chip storage)
- ☑ TRVB F 124 (First and extended extinguishing help)
- ☑ TRVB H 105 (Fireplaces for solid fuels)
- ☑ Ö-Norm H5170 (Heating systems - requirements for buildings and safety technology as well as fire- and environmental protection)
  - ☞ Walls and ceilings REI30 (F30)
  - ☞ Doors EI30-C2 (F30)
    - ☞ Width: ≥ 0,8 [m]; Height: ≥ 2 [m]
  - ☞ Protect fuel storage room against water

12.3.2 German regulations

☑ FeuVO (Fire regulation of provinces)

12.3.3 Swiss regulations

☑ VKF (Association provincial fire insurances)

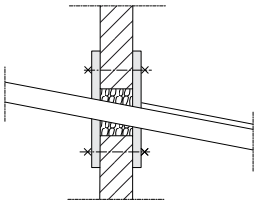
☞ important aspects of VKF "Fire protections standards" - Version 26.03.2003

☞ Doors and rooms with fire resistance EI (nbb)

☞ Walls behind heating systems must be executed out of fire-resistant material and at least 0.12 [m] thick.

☞ Highly flammable materials like wood insulation wool, straw, paper or similar materials shall not be stored in the boiler room.

12.3.4 Fire resistance of the wall breakthrough



ensure fire resistance of the wall breakthrough (F90)

❒ Cover with steel sheets (thickness at least 1.5 [mm])

❒ Cover with fire-resistant plates (thickness at least 8 [mm])

☞ Use steel dowels for fixing the cover

❒ Ensure that there is a gap between the hutch of the extraction auger and the wall.

☞ also prevents the transmission of noise

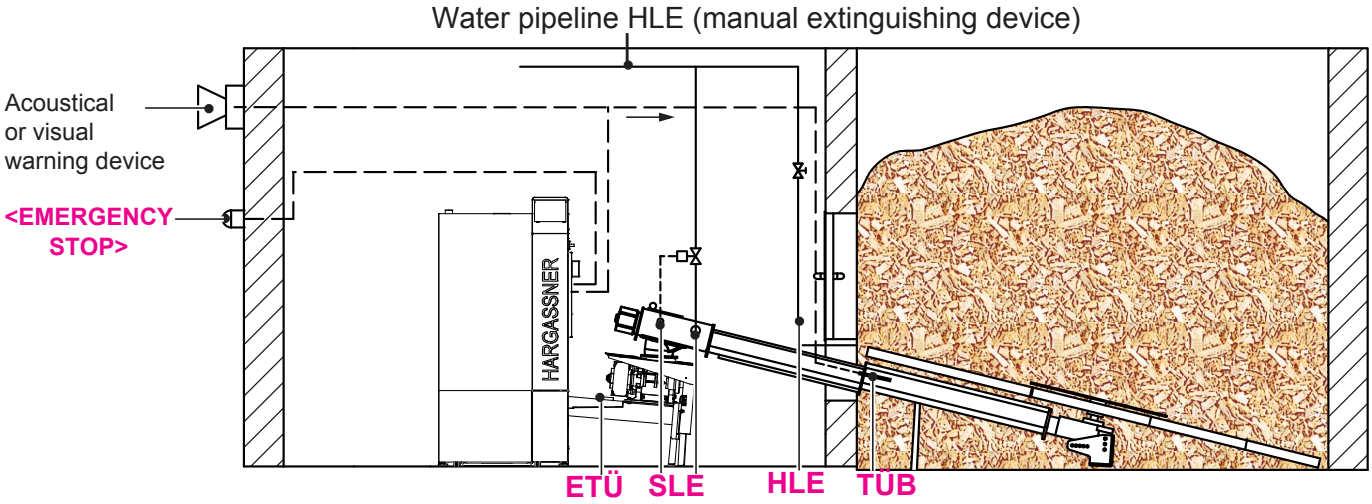
❒ Filling: with rockwool (F90)

12.4 Ventilation of the boiler room

For the combustion process, an air supply and exhaust opening in the boiler room need to be installed.

	N O T E
☞	**<u>Please find the size of air ventilation openings in your local regulations</u>** Hargassner Minimum requirements: Provide an air ventilation opening of 5 [cm²] per [kW] Boiler-Nominal heating output, but at least a total square of 200 [cm²]. Ensure that no impairments through air steamings or climatic influences arise. If there are gratings installed, the cross-section-area has at least to be the minimum of 200 [cm²].

12.5 Possible safety equipment on site



Term	Description
Heating main switch	Heating main switch for switching off the complete boiler system. For outside installation please check federal regulations. Serves for shut down of the heating system in case of fire only!
TÜB	TÜB (Temperature monitoring at fuel storage room) Exceeding 60 [°C] in the fuel storage room, an acoustical or visual warning signal occures.
HLE	Manual extinguishing device with water in the fuel storage room. HLE = Water pipe under pressure (min. 3/4") with a stop valve in the boiler room The pipe ends about 15 [cm] above the extraction auger
SLE	Automatic extinguishing system: SLE = At a temperature of 50 [°C], measured below the stoker unit, the valve of the extinguishing device opens and floods the stoker auger.
ETÜ	Temperature monitoring at stoker unit ETÜ = At a temperature of 50 [°C], measured on top of the stoker auger, an error message is sent to the control unit.
Fire extinguisher	Install the fire extinguisher easily accessible and in accordance with local laws

N O T E

Installation of HLE and TÜB

Install **HLE and TÜB prior filling** the storage room.

- ☞ Ensure easy accessibility to fuel storage room
- ☞ To start up the boiler, fill the storage room only as far that the fuel is transported in the extraction auger of the agitator.

12.5.1 Austrian regulations

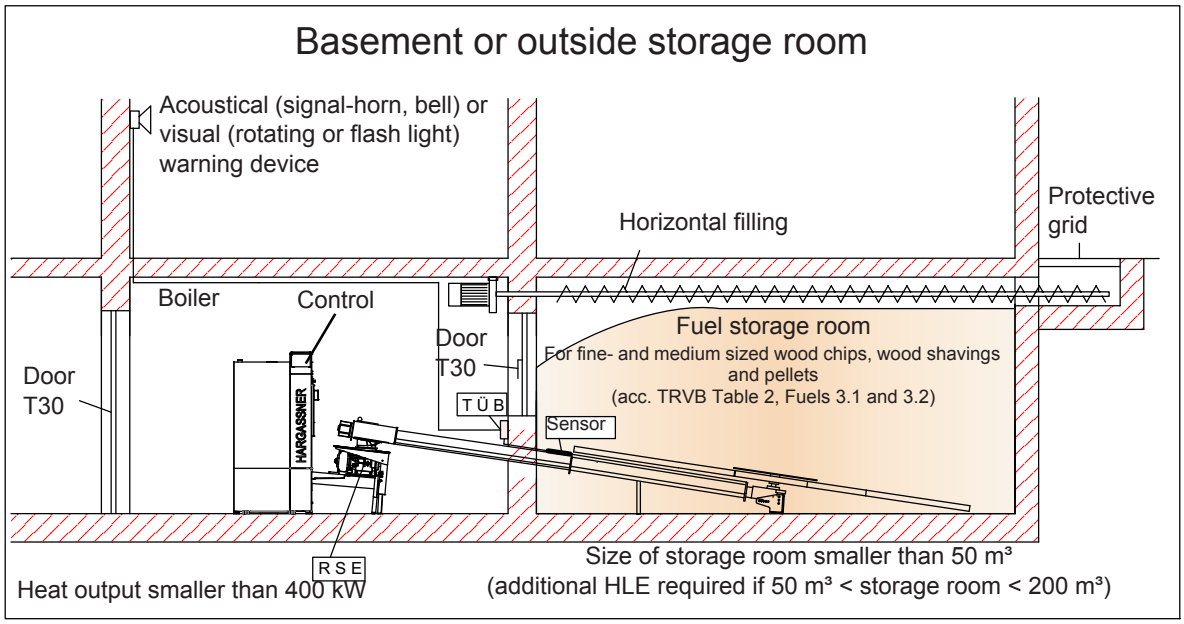
☑ TRVB H118

The certified rotary valve **(RSE)** and the burn-back protection **(RZS)** are integrated in the boiler.

The temperature monitoring of the fuel storage room **(TÜB)** is mandatory and therfore required in each case.

Depending on the construction of the fuel storage room, there are several possibilites for the installation of **(HLE)** and **(SLE)**.

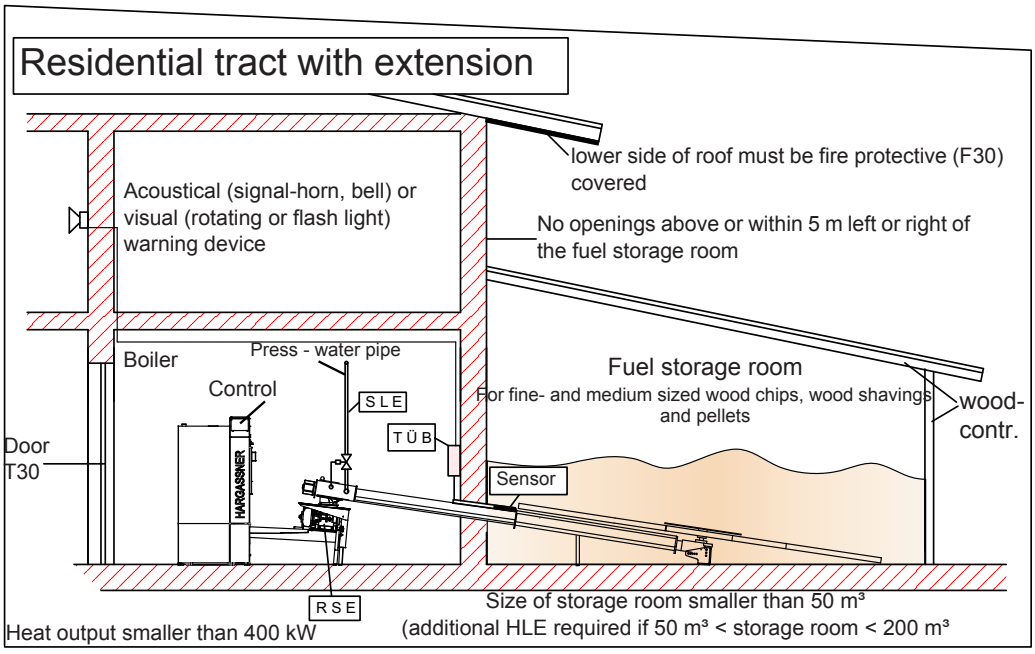
Closed fuel storage room


Basement or outside storage room
Acoustical (signal-horn, bell) or visual (rotating or flash light) warning device
Protective grid
Horizontal filling
Boiler
Control
Door T30
Door T30
Fuel storage room
For fine- and medium sized wood chips, wood shavings and pellets
(acc. TRVB Table 2, Fuels 3.1 and 3.2)
T Ü B
Sensor
HARGASSNER
R S E
Heat output smaller than 400 kW
Size of storage room smaller than 50 m³
(additional HLE required if 50 m³ < storage room < 200 m³)

- F90 for outside walls, floor and ceiling
- F30 / F90 for intermediate wall between boiler room and fuel storage
- T30 for the boiler room door and the fuel storage door
- If the building is equipped with a fire alarm system, the fuel storage room must be integrated

Size of the enclosed storage area	Additional safety requirements
≤ 50 m³	**no additional requirements**
> 50 m³	**HLE**
> 200 m³	**HLE + SLE**

Extension of the fuel storage room to a residential building

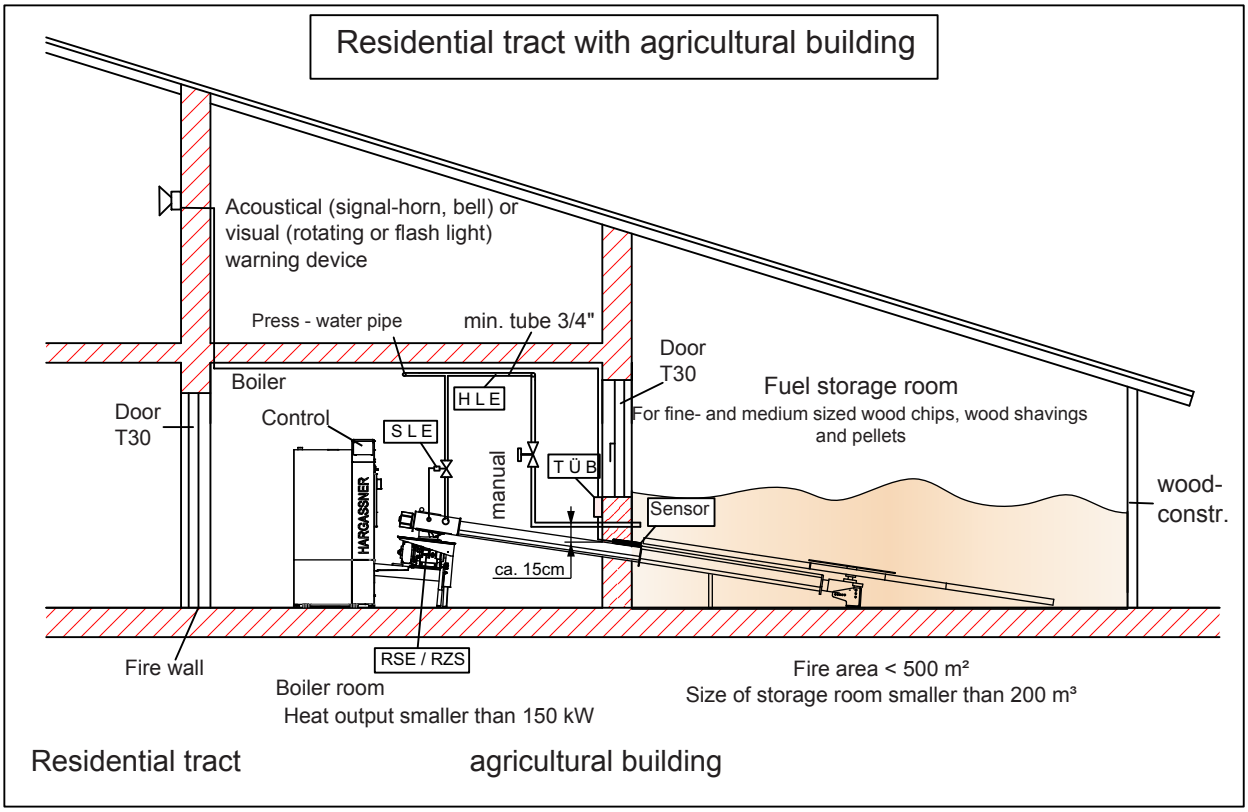

Residential tract with extension
lower side of roof must be fire protective (F30) covered
Acoustical (signal-horn, bell) or visual (rotating or flash light) warning device
No openings above or within 5 m left or right of the fuel storage room
Boiler
Press - water pipe
Control
S L E
T Ü B
Door T30
Fuel storage room
For fine- and medium sized wood chips, wood shavings and pellets
wood-contr.
Sensor
HARGASSNER
R S E
Heat output smaller than 400 kW
Size of storage room smaller than 50 m³
(additional HLE required if 50 m³ < storage room < 200 m³

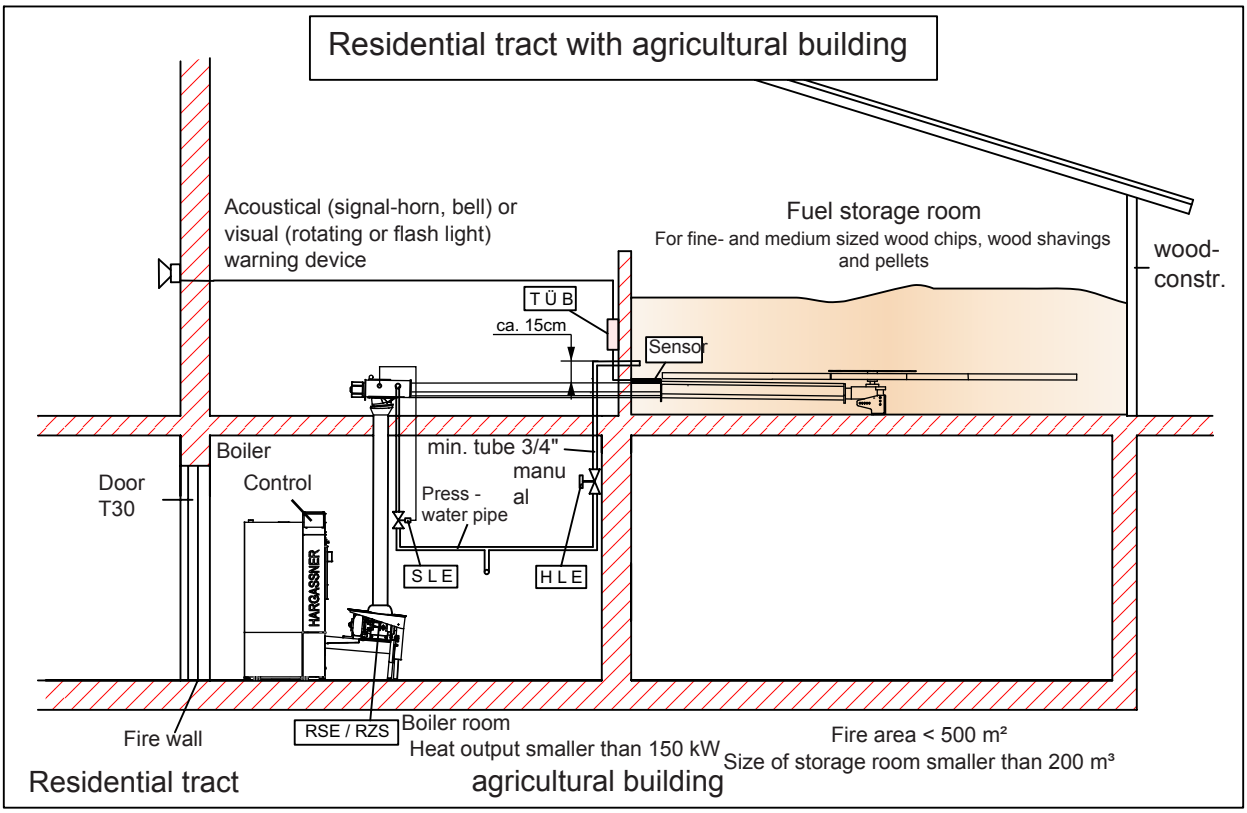
Size of the enclosed storage area	Additional safety requirements
≤ 50 m³	**SLE**
> 50 m³ - 200 m³	**SLE + HLE**

Agricultural building

If the fuel storage room is a **agricultural used building** (of a farm)

↳ HLE + SLE (independent of the fuel storage room size)





12.6 Fire extinguisher

Install verified fire extinguisher (every 2 years) easily accessible outside of the boiler room right next to the boiler room door:

Boiler room size	Amt. of ext. powder	Certification
< 20 [m²]	6 [kg]	EN3
20 - 50 [m²]	12 [kg]	EN3

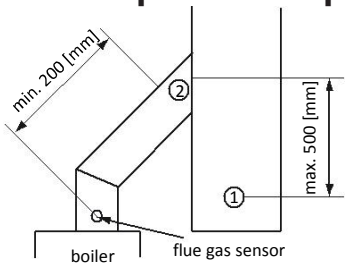
12.7 Exhaust system - Flue pipe

	Unit	ECO-HK 20	ECO-HK 30	ECO-HK 35	ECO-HK 40	ECO-HK 45	ECO-HK 50	ECO-HK 60
Nominal Power	[kW]	20	32	35	40	45	49	60
Minimum Power	[kW]	6	9	10.5	12	13	14.7	18
Flue gas temperature	[°C]	140	150	160	140	150	150	160
CO2	[%]	14	14	14	14	14	14	14
Mass volume	[kg/sec]	0.0104	0.0154	0.0180	0.0205	0.0232	0.0235	0.0309
Necessary pressure	[Pa]	5	5	5	5	5	5	5
Flue draft max.	[Pa]	10	10	10	10	10	10	10
Flue pipe diameter	[mm]	150	150	150	150	150	150	150

Install the exhaust system according to federal and local requirements. verified ÖNORM EN 13384-1

- ❒ The flue pipe is rising towards the chimney and should be as short as possible.
- ❒ Install appropriate openings for cleaning.
- ❒ An explosion flap with draught stabilizer must be installed
- ❒ Insulate the flue pipe:
  - ☞ Protection of a hot surface (Risk of burn)
  - ☞ Protection of flammable materials and parts (eg. electrical wiring)
  - ☞ To reduce condensation
  - ☞ Execution: Insulation 30 [mm] (Rockwool with aluminium coating) ☞ Optimum Insulation > 50 [mm]
  - ☞ Tape joints
- ❒ No flammable materials within 20 [cm] of an insulated flue pipe.

12.8 Explosion flap (Draught stabilizer)



Draft stabilizer with gas meter correctly set to 10 [Pa]
The draught stabilizer may be installed at two different positions.

- ❒ Pos. 1 (Distance to chimney max. 500 [mm])
  - • less sensitive against over pressure
  - • high neg. pressure may only be reduced slightly
  - • more installation work
- ❒ Pos. 2 (Distance to flue gas sensor min. 200 [mm])
  - • Neg. pressure may be reduced well
  - • Easy installation
  - • sensitive against over pressure

13 Hydronic Installation

☑ Install the hydraulic according to enclosed hydraulic scheme.
  ☞ Design criteria according to EN 12828
☑ Note description on boiler
☑ Accumulator with sufficient volume
☑ Accumulator with integrated HWS - coil
  ☞ HWS mixer mandatory
☑ Connection of all safety devices:
  HLE, SLE, Thermal safety circuit
☑ Check opening direction of mixing valve
☑ Install the hydraulic control valves according to scheme
☑ Install sensors according to hydraulic scheme
  ☞ see enclosed information „sensor installation“
☑ Heating water according to ÖNORM H 5195-1, VDI 2035, SIA 384/1
  treat heating water at first fill or refill.
☑ The water in the heating system should be clean and free of corrosive elements.
  ☞ Water from waterworks normally meet these requirements

Extract ÖNORM EN 5195-1:

	N O T E
☞	**Refill of water in the heating system** Vent filling tube prior refill to prevent air in the hydraulic system. ☞ Fill tube with water.

13.1 Back end protection

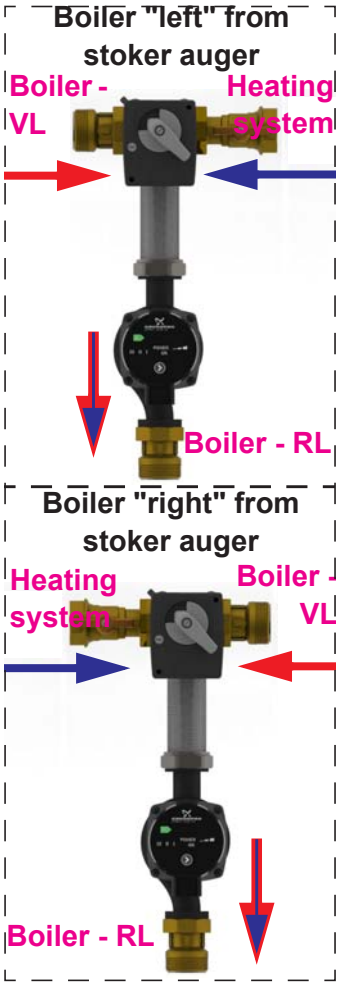
	C A U T I O N
	Corrosion in the boiler through condensing water! **Damage of the system through aggressive condensate.** • Install back end protection properly and according to hydraulic scheme.

If the plant drops under the dewpoint, condensing water is produced. This, in combination with residual pieces of the combustion leads to the production of aggressive condensate in the boiler.

☞ As long as the heating water return is under the minimum return temperature of the boiler, an admixture of the flow takes place.
  ☞ Regulation to constant return temperature
  ↳ at (almost) any time an admixture takes places

	N O T E
☞	**Use a Hargassner back end protection** ☞ The Hargassner back end protection is designed for a perfect operation of this boiler.

13.1.1 Hargassner back end protection



See adjoining images - Back end protection RAG of a „**LEFT**“ and „**RIGHT**“ boiler.

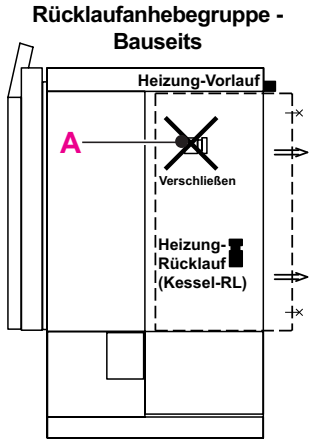
The following shall be respected:

☞ The back end protection shall be mounted on the boiler's lateral side
  ☞ For mounting the back end protection, please see enclosed installation manual
☞ pay attention to the mixer direction

The mixer is "CLOSED" - when the circuit is closed, the mixer is "OPEN" - when the return **(RL)** is open.
During operation the return temperature increases when the mixer "CLOSES" and the return temperature decreases when the mixer "OPENS".

❒ Install a safety venting device
❒ Vent the pump

13.1.2 Back end protection - on site



Adjoining image shows the back end protection connections of a „**LEFT**“ boiler.
↳ for a "RIGHT" boiler, use the image mirrored

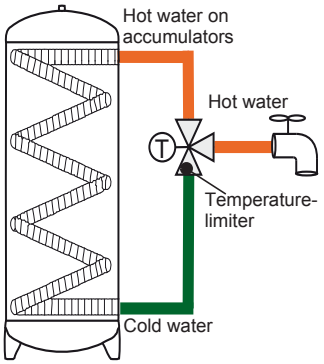
The following shall be respected:

❒ remove lateral boiler cover
❒ close not used pipes **(A)**

☞ pay attention to the mixer direction

❒ Install a safety venting device
❒ Vent the pump

13.2 HWS-mixer

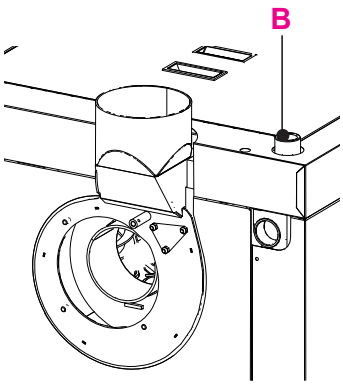


☑ Hot water heating with accumulator and integrated HWS coil or integrated HWS

↳ to prevent any burnings, install a temperature limiter

13.3 Security group / Safety valve

13.3.1 Security group at ECO-HK 20 - 60



❒ Install a 3 [bar] over pressure valve (Security group) on top of the boiler **(B)**

☑ Check tightness

	N O T E
☞	**<u>Connect drain to over pressure valve</u>** To ensure a proper drain after the overpressure valve triggered, a hose or tube must be installed between the over pressure valve and the drain. The drain with cone must be free to inspect, to easily see any leakage of the valve.

14 Electrical installations

For electrical installation, a detailed circuit diagram is included.

- Wiring diagram
- Electrical scheme of the sensor, motors, pumps, mixers, initiators
- Instructions for connecting the main switch next to the boiler room
- Information for lengthening of cables

Works on electrical equipment may only be carried out through

- authorized staff
- according to VDE or ÖVE

C A U T I O N

During electrical installation, pay attention to the position of the exhaust fan and the flue pipe!

Fire hazard

- The insulation of cables and cable shafts are flammable.
- Distance of electrical wires to naked flue pipe:
  minimum: 40 [cm]

Ensure minimum distance of electrical wires from parts outside of the boiler to the hot flue gas pipe and the exhaust fan. (Main power supply, sensors, pumps, mixer-control)

☑ Main powre supply to the control
☑ Protection of the supply line with fuse according to electrical scheme
  ☞ Note instructions in wiring diagram
☑ Heating main switch (emergency stop) in front of the boiler room door
  ☞ Complete disconnection of electrical supply to the control
☑ Connection of necessary safety equipment
  ☞ ETÜ (Temperature monitoring at stoker auger)
  ☞ TÜB (Temperature monitoring at fuel storage room)
  ☞ Install warning light or horn so that it can be noticed easily
  ☞ All sensors for a safe operation of the boiler (according to wiring diagram)
☑ Connections of heating circuits (pumps, mixers, sensors)
☑ Install outside temperature sensor
  ☞ do not mount the sensor in direct sunlight

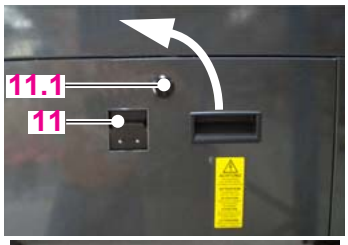
14.1 Fault lamp

To display errors, a fault lamp has to be installed.

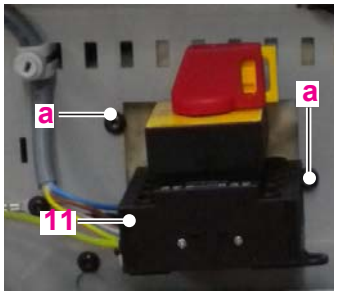
⇨ Wiring diagrams of the boards in the cabinet

- Acoustical (horn) or visual warning device (rotating light)

14.2 Mount main power switch

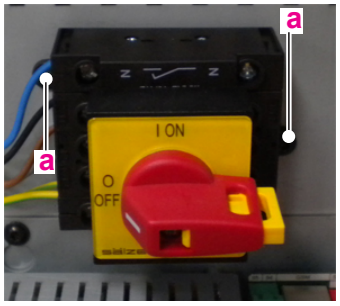


❒ Open turn-type lock **(11.1)** with plastic key *(on boiler door handle)*
❒ Open and remove covers from the control box

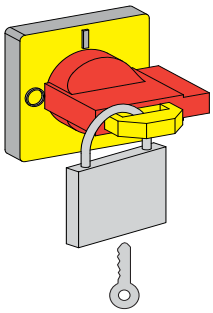


❒ Loosen 2x tapping screws **(a)** from control board plate

❒ Remove main power switch **(11)** and place correctly
☞ Position "ON" must be on top

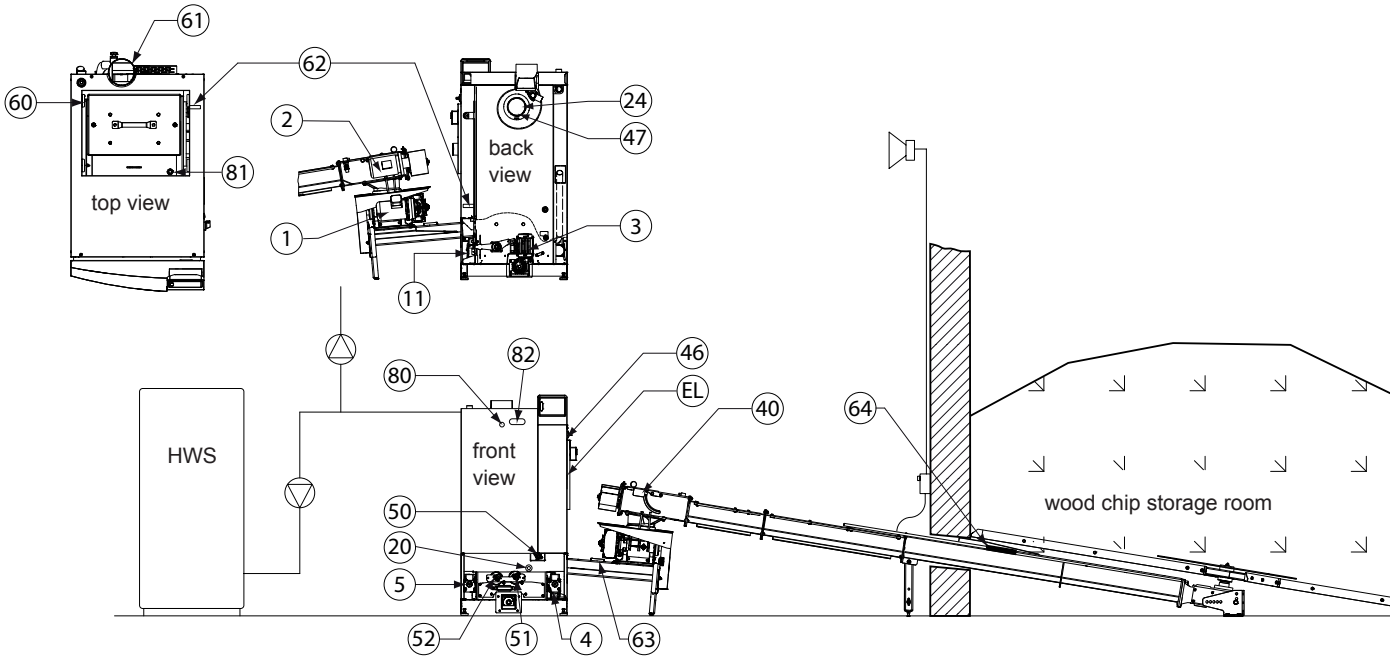


❒ Fix main power supply on the two fixing points of the board ground plate
❒ 2x tapping screw **(a)**
❒ Refit covers from the control box
❒ relock with turn-type lock



❒ Turn main power switch **(11)** to position **<0>**
❒ Close with padlock supplied by others.
(for maintenance repairs)
❒ During assembly keep locked to prevent unexpected activation of moving parts
☞ Kepp key safe

14.3 Cable assembly



❒ Connect the cable according to the diagramm in the cabinet
☞ #note the numbers on the connectors
❒ Mount sensors according to the attached wiring diagram

15 Sensor installation

15.1 Outside sensor

Position:

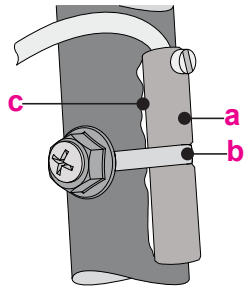
☑ non-sunny side of building (North; North-East)
  ☞ coldest side of building
☑ Installation height min. 2 [m]
☑ Check for external heat sources (falsification)
  ☞ Chimney, warm air ducts, windows and doors
☑ Cable outlet from sensor on bottom
  ☞ Prevent sensor from moisture
☑ electrical installation with 2-pole cable
  ☞ Min. profile see wiring diagram

15.2 Flow-, Accumulator-, External sensor

(according to hydraulic scheme)

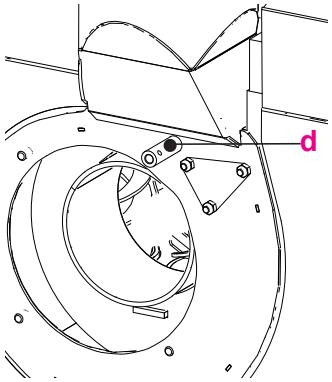
☑ Execution of the temperature sensors (except flue gas sensor)
  - PT 1000 immersion sensor with pre-connected sensor cable
  ☞ Do not damage/break sensor cable
  ☞ If required, extend cable:
    ☞ Min. profile see wiring diagram

15.2.1 Flow sensor for heat circuits



☑ Installation and position
  • approx. 50 [cm] after heat circuit pump
  • metallic blank surface
  • Fix with enclosed brass housing **(a)** and strap **(b)**
    ☞ prior mounting the sensor, apply heat conducting paste **(c)** for better heat transfer

15.2.2 Flue gas sensor



☑ Thermal element (Type K) with pre-connected sensor cable
  ☞ Do not damage/break sensor cable
  ☞ If required, extend cable:
    ☞ Min. profile see wiring diagram

☑ Mounting the flue gas sensor
  ☞ Put sensor top into the aperture provided **(d)** (stick into exhaust fan and fix with feather)

15.2.3 Boiler-, HWS-, Accumulator- and External heat sensor

☑ Mount with provided immersion sleeve
☑ Positioning of accumulator- and HWS sensor

A T T E N T I O N

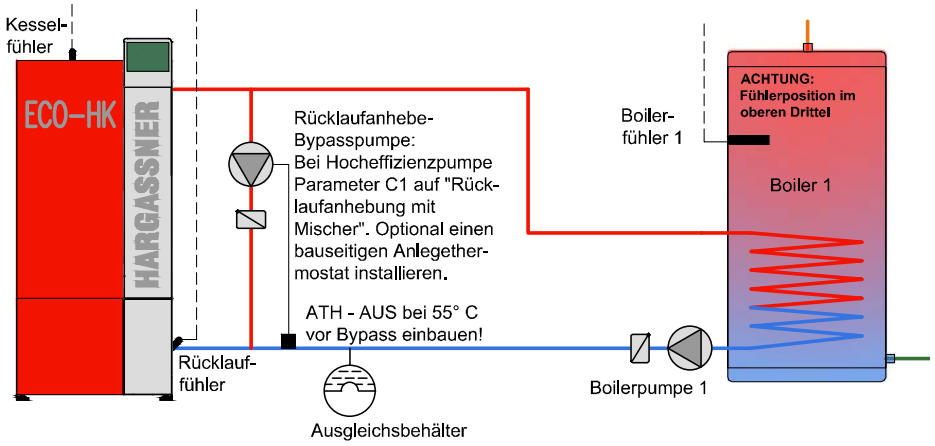
Correct sensor position

- To control the HWS- and accumulator loading - place the sensors correctly.

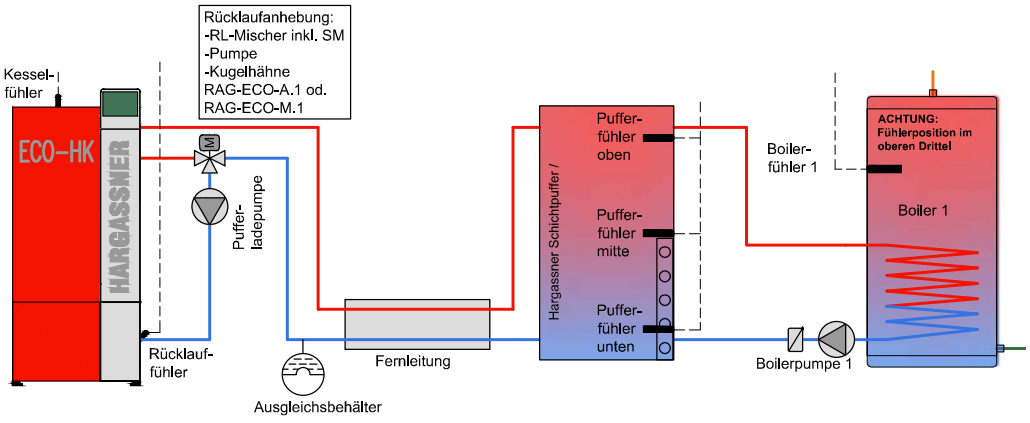
Sensor resistance

Boiler-, HWS-, Accumulator-, Flow-, Return-, and External heat sensor	
in °C	in Ohm
-20	922
-10	960
0	1000
10	1039
15	1058
20	1077
25	1097
30	1116
35	1136
40	1155
45	1174
50	1193
55	1213
60	1232
65	1252
70	1270
75	1290
80	1309
85	1328
90	1347
95	1366
100	1385
Room temperature sensor (Remote control FR25) Switch setting AUTOMATIC (Clock) and mid setting of the remote adjuster (independent of the room temperature)	
3340 - 3650 [Ω]	

external HWS



Accumulator with external HWS



16 Remote control FR 25 / FR 35/ FR40

☞ For a professional installation and operation of the remote - see user manual of the according remote control;
☞ **Attention:**
The remote control has to be parametrised to the heat circuit in the installer level.
❒ Install remote control in light switch height

Place of installation:
☑ no direct sunlight, draught, radiators, chimney, etc.
☞ Measurement of the real room temperature
☑ in appropriate room (e.g. Living room, etc.)
☞ in those room no stove should be installed (tile stove, etc.)
☞ Increase radiator thermostat valve to a higher value as the value in the Control
↳ Influences the room sensor
↳ The flow of the according heat circuit will be changed, as a result, other rooms will be too cold or too warm

16.1 Remote control FR25 (analogue):

☞ FR25 can be used for heat circuits - connected to the HKM or HKR
(not available for heat circuits from the Heat circuit board A)
Remote control with room sensor
❒ Connect clamp 1 and 2 (to FR 25)
Remote control with room sensor
❒ Connect clamp 1 and 3 (to FR 25)
Fault lamp:
The remote control is equipped with a red LED, which may be connected to the boiler. This LED lights, if a warning or an error occurs on the boiler display.
❒ Connect clamp 4 (+) and 5 (-) - (at FR 25)

16.2 Remote control FR35 (digital)

☞ FR35 can be used for all heat circuits (HKM; HKR; HKA)
☑ Bus-cable 2x2x0,5 [mm²] shielded, pair-twisted (e.g: LiYCY)
☞ for a length of more than 100 [m] a diameter of 0.75 (mm²]

16.3 Remote control FR40 (digital)

☞ FR40 can be used for all heat circuits (HKM; HKR; HKA)
☑ Bus-cable 2x2x0,5 [mm²] shielded, pair-twisted (e.g: LiYCY)
☞ for a length of more than 100 [m] a diameter of 0.75 (mm²]

17 HKM, HKA or HKR

17.1 Heat circuit module (HKM) 0, 1, 2

A maximum of three HKM's may be connected. The connection to the boiler control board is done with a Bus-cable (to the CAN-Bus plug). At the HKM the selection switch is set to 0 (at HKM 0 = 1+2 HC and 1 HWS-circuit), to 1 (at HKM 1 = 3+4 HC and 2 HWS-circuit) and to 2 (at HKM 2 = 5+6 HC and 3 HWS-circuit); when delivered, this switch is always set to 0)

17.2 Heat circuit board A

The heat circuit board A is for the extension of heat- and HWS circuits from the boiler. The connection to the boiler control board is done with a Bus-cable.
On the heat circuit board the selection switch is set to A (HC A + HWS A).

17.3 Heat circuit controller HKR

For a maximum extension of heat- and HWS circuits, as well as accumulators or external boilers - eight HKR's may be connected. The connection to the boiler control board is done with a Bus-cable.
(to CAN-Bus plug). On the HKR the selection switch is set to 1 (at HKR 1), 2 (at HKR 2), and so on.....
(when delivered, this switch is always 1).

18 Stickers for the storage room

BRENNSTOFFLAGERRAUM
SICHERHEIT HACKGUT
G E F A H R
Selbsttätig anlaufende Förderseinrichtung.
Unbefugten ist der Zutritt zum Brennstoff-Lagerraum verboten
Kinder fernhalten!
Vor dem Betreten:
Anlage mit Netzhauptschalter an der Steuerung ausschalten!
Zugriff zur Transportschnecke und zu beweglichen Teilen vermeiden!
Nicht im Bereich der Federarme verweilen!
Im Bereich des Brennstoff- Lagerraumes kein offenes Feuer verwenden!
Im Bereich des Brennstoff- Lagerraumes nicht rauchen!
W A R N U N G
Vor und während dem Befüllen des Lagerraumes mit Brennstoff, die Anlage unbedingt einschalten!
Damit sich die Federarme unter der Deckscheibe einziehen
Achtung: Beim Befüllen mit Pellets unbedingt Betriebsanleitung lesen!
Brennstoff vor Feuchtigkeit schützen!
HARGASSNER

Detailed explain the contents of the sticker to the operator.

Affix the sticker in the access area of the fuel storage room (eg. Fuel storage door) that it can be seen and noticed immediately PRIOR (re)filling.

Affix the sticker to a smooth, well-adhering surface.

19 Permits and reporting requirements

A T T E N T I O N

<u>The heating system has to be approved through the responsible authority body</u>

The construction or reconstruction of the heating system has to be approved by the appropriate regulatory authority.

- Report reconstruction to the supervising office
  - ☞ Austria: responsible building authority
  - ☞ Germany: Chimney sweep or building authority
  - ☞ Other countries: Follow the requirements of the state´s own regulations.

20 Commissioning of the heating system

D A N G E R

<u>Unauthorized commissioning!</u>

Commissioning through Hargassner authorised staff only.

- Prevent unauthorized commissioning.
- Absolute no working processes on running heating system.
- Only operate the system independently after signed commissioning protocol.

Chapter X: Appendix

	N O T E
	Please be advised that we are not responsible for damages or malfunctions resulting from non-observance of the operation manual.

1 Copyright notice

This manual should be kept confidential. The manual is intended solely to be used by authorised persons.
The transfer to third parties is prohibited and is liable to compensation. All rights reserved, also translations.
No part of this manual may be reproduced or processed using electronic systems, duplicated or distributed without permission of Hargassner GmbH.

1.1 Special measures prior commissioning through the operator

Licensing requirements for safe operation and accident prevention regulations must be observed!
Work on hydraulic systems must be carried out only by personnel with specialised knowledge and experience in hydraulics!

1.2 Liability

The AUTOMATIC WOOD BIOMASS BOILER is a state-of-the-art product and manufactured and tested according to recognised safety regulations. However, improper use may cause lethal hazards for the operator or third parties or may damage the unit and other property.

The AUTOMATIC WOOD BIOMASS BOILER must only be operated as intended and in technically perfect condition!
Especially, errors tending to affect the safety shall be cleared immediately!

Liability for the function of the AUTOMATIC WOOD BIOMASS BOILER shall be borne by the owner or user insofar as the device has been used by persons without the necessary knowledge or authorisation from Hargassner GmbH, has been improperly used, serviced or repaired or has been handled in a manner that does not conform to proper use.
In the interest of the continuous development and improvement of our products, we reserve all rights to make technical changes to the information contained in our printed material. Changes, errors and printer's errors do not justify claims for damages.
Only original Hargassner- spare parts must be used.
In addition to the guidelines in this operation manual, please follow general guidelines for safety and accident prevention. The AUTOMATIC WOOD BIOMASS BOILER must, at least be switched off 15 minutes prior any works on the boiler (Maintenance works, unscrew covers, etc.)
The manufacturer,Hargassner GmbH , shall not be liable for direct or consequential damage resulting from failure to observe the technical instructions, guidelines and recommendations. The vast experience of **Hargassner GmbH** , latest production technology and highest quality standards guarantee the reliability of this boiler system. **Hargassner GmbH UNDER NO** circumstances be held liable for a safe operation of the product, for damage to the product itself or for consequential damage caused by the product if the damage has been caused by incorrect use or handling of the product.
The customer has NO warranty claims:

- if heating fuel is missing wrong or of poor quality
- if damages occur through incorrect assembly, misuse or lack of maintenance
- if the installation manual and operation manual is NOT observed
- for defects that do not affect the performance of the system. E.g.: Paint defects,....
- for damages arising from force majeure like fire, flooding, lightning stroke, electrical surge, power loss, ...
- if a non-licensed installer or non-licensed plumber installs the product
- for damages arising through air pollution, very dusty surrounding, aggressive vapours, corrosion through oxygen (non diffusion-resistant plastic tubing), installation in inappropriate rooms (laundry room, ...) or through further use, even though a defect has been recognised.

For the correct reparation, maintenance and service, or any other error not mentioned in this manual, **Hargassner GmbH** has to be contacted prior any works on the plant.
Warranty and liability of the general terms and conditions of **Hargassner GmbH** are not to be extended because of hints pointed out in this manual.
The **safety instructions** in this manual must be observed. Only use **Hargassner GmbH** - spare parts or from **Hargassner GmbH** released, equivalent spare parts. Constant technical innovations mean that we reserve the right to modify the design of our products and services without notice.
For any questions always prepare the Hargassner **Boiler number** .

We wish you all the best with the WOOD BIOMASS BOILER.

Notes